Weyerhaeuser Co. Ltd. – Kent License #5

Forest Management Plan

2002-2026

THE KENT LICENSE # 5
2002-2026 MANAGEMENT PLAN

Prepared By: Weyerhaeuser Company Limited

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Executive Summary

In preparation of this Management Plan, Weyerhaeuser Company Limited has followed the requirements of the New Brunswick Crown Lands and Forests. Both timber and habitat supply have been forecast over an 80 year timeline. Certain habitat concerns have been forecast over a 35-year time line. Timber supply for the first 25 years of the plan has been spatially blocked and maps of License 5 have been produced for the Department of Natural Resources inspection. The plan addresses the objectives that were set out in "A Vision for New Brunswick Forests...Goals and Objectives for Crown Land Management". These objectives are:

Timber

- The timber supply was maximized for the 80-year management plan horizon after meeting the other objectives
- The Tolerant Hardwood guidelines were followed in the construction of this plan for Tolerant Hardwood and Tolerant Hardwood-Softwood stands on License 5.
- A number of harvest prescriptions were used with clear cutting being the dominant harvest prescription.

Habitat Types

- The Gross OSFH supply was met or exceeded from Period 8 till the end of the planning horizon. The Net OSFH objective can not be met within the OSFH blocks. The net objective can be met if the OSFH content of the Proposed Protected area is included.
- The Large Mixed-wood Habitat, Old Mixed-wood Habitat and the Old Hardwood Habitat levels were all met or exceed from Period 1 till the end of the planning horizon.
- Within the Deer Wintering Areas, interventions were used to maximize future Moderate Winter Deer Habitat, with Severe Winter Deer Habitat being increased as well. Trends for the Moderate Winter Deer Habitat show an eventual decrease in habitat, but with habitat levels being higher than with no interventions.

Watercourse Buffers

- The guidelines for watercourse buffers were followed for the construction of this Management Plan. Buffer harvest was only modeled for the all buffers (30, 76 & 100 meter) on License 5.

Forest Ecosystems

- All vegetative community objectives were met, with the exception of THSW. This was not met in the first period since there is a lack of sufficient THSW falling in the appropriate criteria until Period 2.
- The protection and preservation of a unique site were identified in this management plan.

Recreation

- Recreational opportunities were maintained in this management plan.

Table 1.0 Summary of 2002 –2026 spatial annual harvest levels on License 5.

Landbase	Primary Volume & Fallout			
	Spruce, Fir & Jack Pine (m^3/yr)	Hardwood (m^3/yr)	Cedar (m^3/yr)	Pine (m^3/yr)
General Forest	40174	20404	3776	2144
DWA	1656	1061	26	50
OSFH	555	1231	0	14
Buffers	156	189	6	7
Total	42541	22885	3808	2215

- Volumes for DWA and OSFH land bases are from Period 1 estimates.
- Volumes reported for cedar and pine are total volumes.
- A 10 % operational net down has been applied to these volumes.

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1.0 BACKGROUND

1.1 Requirements of the Crown Lands and Forests Act

Management of Crown Lands of New Brunswick is regulated by the New Brunswick Crown Lands & Forests Act. This act was first legislated in 1980 and creates 10 Timber Licenses. These Timber Licenses were assigned to the large forest based companies within the province. Administration of the act is done by the Department of Natural Resources and Energy (DNRE), which requires each Licensee to create management plans for their timber license. These management plans describe how the Licensee plans to manage for both timber and non-timber resources. Sustainable supplies of timber are determined for an 80-year horizon and the source of that sustainable supply is mapped for 25 years to ensure its availability. The first management plans were prepared in 1982 and are to be revised every 5 years.

Each Licensees management plan is carefully reviewed by DNRE and approved by the Regional Resource Manager. After each 5th year revision the Licensees are evaluated on the success of their management efforts to meet the forest level objectives as described in the management plan.

The non-spatial/spatial management plan submission in this document has been prepared by Weyerhaeuser Company Limited (the Licensee) and describes the management strategy for the Kent License (Crown License #5) for the next 80 years. This management plan is set for implementation on April 1, 2002 and includes harvest block mapping that spatially recognizes the source of the sustainable harvest and habitat areas for the next 25 years.

1.2 Summary of 1997 Management Plan

The management plan for 1997-2001 was developed by Eagle Forest Products (now part of Weyerhaeuser Company Limited) concerning Timber, Mature Coniferous Forest Habitat (MCFH), Deer Wintering Areas (DWA) and biodiversity. Table 1.1 illustrates the 1997-2001 harvest for License 5 for Spruce, Fir, Jack Pine, Hardwood, and Cedar. During the 1997 plan, a new Protected Area, near Kouchibouquac Park, was proposed. This area comprised 6 % or 4000 hectares of Crown License #5, and due to a moratorium harvest blocks in that area had to be excluded.

Table 1.1 Summary of Spatial Cut per Year for 1997 Management Plan

	Spruce, Fir & Jack Pine	Hardwood	Cedar	Pine
1997	52526	40559	1478	2368
1998	56877	29482	4088	1970
1999	58148	33532	2205	2270
2000	63139	29552	2132	2255

1.3 Management Planning Objectives for 2002

The 2002 goals and objectives for Crown Land management are described in the document entitled "A Vision for New Brunswick Forests" and a copy is included in Appendix 2. This document describes a range of objectives for Crown Land management including those of biological, environmental, social and economic importance. It is linked to the Canada's Forest Accord, a national document that describes objectives for maintaining the sustainability of Canada's forests. There are a number of specific objectives within the " A Vision for New Brunswick Forests" with operational requirements, which must be addressed, in the 2002-management plan. These include:

- Timber: The Province of New Brunswick is very dependent on the forest industry to sustain economic benefits. To satisfy this requirement there are objectives that call for the long-term sustainable timber supply to be maximized after meeting other non-timber objectives described below. In order to do this, given the current age structure of the Crown Forest, it is necessary to harvest the oldest, fastest declining forest stands first so that as much natural mortality as possible can be captured. These requirements are further described in Section 3.0.

- Habitat Types: Wildlife species in New Brunswick need various types of habitat in order to live. On a stand level, four types have been defined and applied to the Kent License. These are Old Hardwood Habitat (OHWH), Old Spruce-fir Habitat (OSFH), Old Mixed-wood Habitat (OMHW) and Large Mixed-wood Habitat (LMHW). Of these, four types, only OSFH has a spatially blocked objective. The method of incorporating the OSFH into 2002 management plan is described in Section 4.0.

- Deer Wintering Areas: The White-tailed Deer relies on two types of habitats for its survival during the winter months. These habitats are called Moderate Winter Deer Habitat (MWDH), and Severe Deer Winter Habitat (SWDH). MWDH is associated with stands that have a high food value. SWDH is associated more with stands that have a high snow and thermal cover. The habitat objective for the Kent License is to improve the MWDH. This requirement is further described in Section 5.0.

- Water Course Buffers: To protect water quality and aquatic habitat, all watercourses on License 5 where the channel exceeds 0.5 meters will require a buffer of vegetation to be left on either side of the watercourse. Specific buffer widths and the method for incorporating this requirement in the 2002 management plan is further discussed in Section 6.0

- Forest Ecosystems: Forest ecosystem objectives have been developed to help maintain the diversity of forest ecosystems and their ecological values. Levels have been determined by DNRE for each Eco-region within New Brunswick and been further broken down to be assigned to each License. For the Kent License these objectives include the forest communities of Black Spruce (BS), Spruce (SP), Jack Pine (JP), Eastern Cedar (EC), Pine (PI) and Tolerant Hardwood - Softwood Stands

(TS). These forest communities and their incorporation into the 2002 management plan is further discussed in section 9.0.

- Recreation: Camping, hiking, hunting, fishing and other recreational opportunities on Crown Land are all part of the lifestyle enjoyed by the citizens of New Brunswick. The maintenance of these existing recreational opportunities is discussed in Section 7.0.

- Unique Sites: Protection and preservation of unique sites of ecological, historical, cultural or scenic value is a requirement of Crown Land management. Those sites identified in this management plan are discussed in Section 8.0.

1.4 Public Input

As part of the management planning process public meetings were held to inform and educate the public. These meetings took place in St. Louis and in Rogersville on January 28 and 29, 2002. The meetings were well received with 70 people attending at St. Louis, and 12 in Rogersville. The delegates represented a cross section of forest users and provided many different perspectives to the process. Most people who attended lived in and around License 5 so had a vested interest in the License since many used the License for recreational and other activities. The three main concerns from the meetings were fuel wood resources for local residents, concern over high level of habitat / restricted areas were being constrained for and some concern over the drop in AAC from the 1997 plan levels. Overall the discussions proved to be interesting and it is hoped will foster a mutually beneficial and constructive industry/private sector relationship.

1.5 Management Planning Procedures

The combination of multiple management objectives makes today's forest management a challenging process. It requires analysis and proper characterization of forest inventory, and projection of future growth of the forest inventory. This is done while trying to balance against other objectives. To properly do this computer based modeling programs must be used, since doing this manually would be impossible. On a stand level, the New Brunswick Growth and Yield Unit Yield Curve Database was used to create yield curves. WOODSTOCK was used for making forest level decisions, while STANLEY was used for blocking those decision made by WOODSTOCK.

A forest is a dynamic entity which in itself leads to complexity. Once involving timber and non-timber objectives this complexity grows. A model of the forest is a tool to give planners the ability to monitor growth and mortality, plus any response to the harvest and silviculture treatments. With the increasing importance of non-timber values, these must be monitored, and if necessary constrained for, within the models. Therefore a model is required that not only reports on forest growth and response to treatment but also monitors the forest potential to support various non-timber objectives. For the 2002 plan, these non-timber objectives are Deer Wintering Areas, Old Spruce Fir Habitat, Large Mixed-wood Habitat, Old Hardwood Habitat, Old

Mixed-wood habitat, and various forest communities.

2.0 PRESENT LAND BASE DESCRIPTION

2.1 Forest Inventory

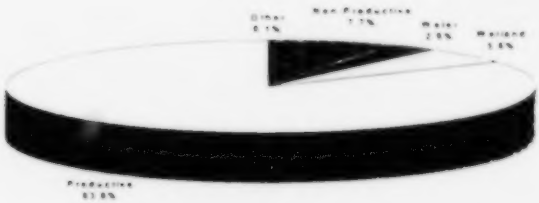
The management plan for License 5 was based on a forest inventory that was developed in the early 1980's. This inventory was interpreted using 1:12500 aerial photographs and a network of temporary forest development sample plots established on the License and nearby private and crown land. The temporary forest development sample plots offered attributes such as volume, age, and height which increased the statistical reliability of the inventory. This inventory is maintained by DNRE using a Geographic Information System. This system is updated annually through the annual reports produced by the Licensee. This would include both harvesting and silviculture activities on the License. This inventory was given to the Licensee for the management plan and was current until 1997. In order to update the inventory to 2001 and assure that the inventory was correct several steps had to be taken:

i. Actual harvesting and silviculture operations from Annual Reports that have taken place were added to the inventory. This included operations up to 2000.
ii. Proposed harvesting and silviculture that both Weyerhaeuser and DNRE Region 2 believe would occur during the 2001-operating season were added to the land base.
iii. The third was a review of all Annual Reports back to 1987 to confirm harvesting and silviculture treatments on the Kent License.

2.1.1 Area Description

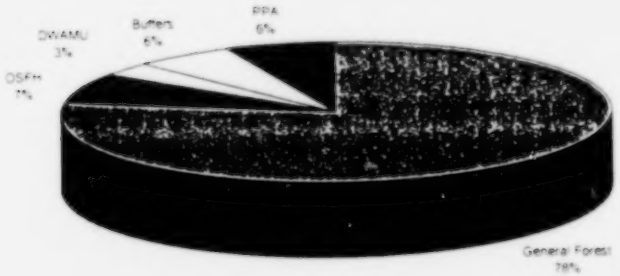
Located in southeastern New Brunswick, south of Miramichi (Figure 2.3) License 5 is almost entirely within Kent County and has a total area of 71,590 ha. As Figure 2.1 indicates, the majority of this area contains productive forestland. (61,543 ha) and it is this landbase that is the focus of this management plan.

Figure 2.1 Summary of the Total License 5 by Land Classification



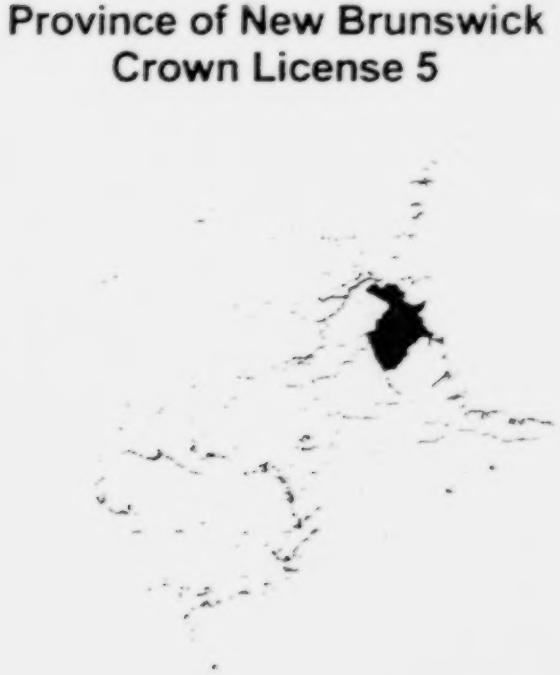
As one can see from the above chart, 84% of the Kent License is comprised of productive land. However, nearly 8% of the License is in a non-productive state. Combine this with the area taken up by water and wetlands, nearly 16% of the Kent License can not be used for forestry purposes. The small percentage of "other" is made up of fields and such found on the Kent License.

Figure 2.2 Summary of License 5 area by primary management objective.



The Kent License is broken up into a number of management objectives. As can be seen in Figure 2.2 the General Forest makes up 78% (productive area) of the productive land base, while OLD Spruce-Fir Habitat and Deer Wintering Areas make up another ten percent (productive area) of the productive land base.
A new management unit for the Kent License is the addition of a Proposed Protected Area. This area makes up 6% (productive and non-productive area) of the Kent License and is situated next to the Kouchibouguac National Park. Due to its nature, no management activities will take place in the Proposed Protected Area. Buffer zones comprise approximately 6% of the license as well and are composed of all buffers on the License.

Figure 2.3 Location of License 5

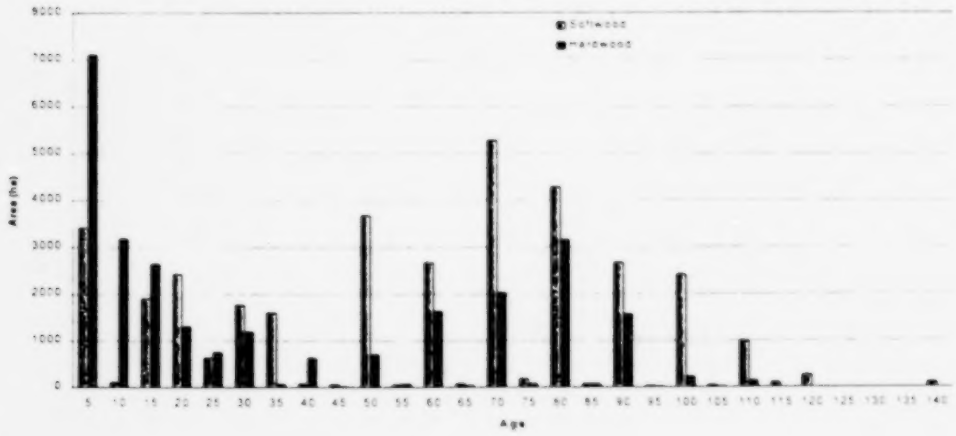


2.1.2 Age Class Distribution

The age class distribution in Figure 2.4 shows that there is a large component of forestland in the younger age classes. A large portion of this area is situated within the "softwood" forest community types on the license. The softwood component of the forest includes many of the softwood dominant mixed-wood types found on the license. Hardwood types consist of both tolerant and intolerant hardwood – mixed wood types. Examples of these would be HWIS

(Hardwood-Intolerant Hardwood/Softwood mix-wood type).
The harvest strategy targets the oldest stands first, which allows one to capture any loss of volume due to mortality. Though only after habitat constraints such as OSFH are met first. This becomes a problem on License 5 since there is such a small amount of older wood that, once the constraints are met, the model must begin to harvest younger stand types. Also the mature and over-mature stands are widely scattered though out the License making it fairly fragmented at this time. One way of rectifying this is by using silviculture to improve stands and provide timber volume at a younger age than would be normally. Such a practice would be the planting of genetically superior trees, which would grow quickly and provide merchantable volume at a younger age. Pre-commercial thinning would also be employed to improve stands for future harvesting. By doing pre-commercial thinning, this may leave more of the mature and over-mature in the forest to eventually improve and balance out the age class structure.

Figure 2.4 Present Age Class Structure of License 5



2.2 Forest Stratification

The forest was stratified along the lines of the Vegetation Communities found within the forest. These were broken out only when differences were found in volume and growth between varying characteristics. In such a case differences were found between eastern cedar, high crown closure stands and low crown closure stands. This relates to the yield curves, which will be discussed in Section 2.3. The data used to investigate these differences was the Forest Developmental Survey (FDS) plots.
For stands that had harvesting or silviculture activities in the past, the appropriate classification was applied to the stand due to the treatment in question. For example, a stand which had been

harvested and then planted Black Spruce would be classified as a PLBS. For a stand pre-commercially thinned to Balsam Fir it would be classified Balsam Fir thin (BFT) or Pure Fir Thin (PFT) depending on the amount of Balsam Fir in the thinning. This information was gathered through the Annual Reports and Forest Inventory maps, plus post-assessments of pre-commercial thins and plantations. A breakdown of the forest strata can be seen in Appendix 3.

2.3 Yield Curves

The yield curves for the License were created by using two methods. The first was to use the New Brunswick Growth and Yield Unit Yield Curve Application in Microsoft Access. This application contained the FDS plots for the entire province up to and including FDS plots done in 1998. This application allowed one to build yield curves using the different characteristics found within the data. This could include site type, crown closure, forest stand type, species, Eco-region etc. Yield curves could be produced for strata made up of any of these characteristics. The yield curves were developed on a first basis of being within Eco-region 6. From there vegetative communities were used and was the basis of the stratification of the forest. The different characteristics were investigated and there was little variance found between them except for a few. In those cases, crown closure was the characteristic where growth and development appeared to differ enough to classify them as separate yield curves. Some plots outside of Eco-region 6 were used, but only where the number of plots were minimal for that vegetative community, and those plots used were similar to those being used in Eco-region 6.

The same procedure was used to create most of the pre-commercial thinning and plantation curves used in the model. However, some of the pre-commercial thinning curves produced was not acceptable so a different approach was taken to produce them. Post-assessment data from pre-commercial thins were used to create stand tables. These stand tables were then ran through STAMAN 26 which produced yield curves for each stand table. Each curve was then examined at its peak and using the Department of Natural Resources method of classifying vegetative communities was applied. These curves were then examined for differences within a vegetative community and were averaged together to produce a yield curve for the vegetative community in question. Once a curve was produced, it was shown to DNRE Region 2 for approval, as were all yield curves created.

For commercial thin and partial cut curves a percentage factor would be applied for the proper scaling of the curve. An example of this would be a tolerant hardwood curve, which was tasked for a partial removal. In this case, the partial cut would be 30% less than the "natural curve" for this stand type. The model would be able to calculate the volume taken by subtracting from one curve to another.

The Forest Management Branch of DNRE in Fredericton produced yield curves used for regenerating stands from clear cuts.

The entire listing of yield curves can be seen in Appendix 3.

2.4 Description of Harvest & Silviculture Treatments

Table 2.1 Harvest & silviculture treatments proposed for License 5

Treatment Code*	Treatment Name	Treatment Response	Stand Type Eligibility
CC_SW	Clearcut Natural (unmanaged SW)	Removal of all merchantable stems of all species	Any softwood stand type
CC_HW	Clearcut Natural (unmanaged HW)	Removal of all merchantable stems of all species	Any hardwood stand type
CC_TS	Clearcut Natural (TS HW)	Removal of all merchantable stems of all species	TS and TH stands <= 5 ha in size
CC_CT	Clearcut Natural (managed)	Removal of all merchantable stems of all species	Any managed stand type
TS_1X	Selection (TS)	Removal of 30% of all merchantable stems of all species	Any TS stand type
TS_2X	Multiple Pass (TS)	Removal of up to 30% of all merchantable stems, with a re-entry time of no less than 15	Any TS stand type
TH_1X	Selection (TH)	Removal of 30% of all merchantable stems of all species	Any TH stand type
TH_2X	Multiple Pass (TH)	Removal of up to 30% of all merchantable stems, with a re-entry time of no less than 15	Any TH stand type
CT_PL	Commercial Thin (plantations)	A 30% removal of all merchantable stems of all species, window of oprotunity between 25 to 45 yrs of age	RP,WP,BS, and JP plantations
CT_TT	Commercial Thin (pre-commercial thins)	A 30% removal of all merchantable stems of all species, window of oprotunity between 25 to 45 yrs of age	BF,PF,BS,HWTS, HWIF thinning types
CE_1X	Selection (cedar)	Removal of 30% of all merchantable stems of all species	Any cedar stand type
CE_2X	Multiple Pass (cedar)	Removal of up to 30% of all merchantable stems, with a re-entry time of no less than 15 years afterwards	Any cedar stand type
SPACE_BF	Spacing SW	Reduction in stand density to enhance diameter growth (non-commerical). Other types	Regen types with stockings of 1.2
SPACE_HW	Spacing HW	Reduction in stand density to enhance diameter growth (non-commerical). Types	Regen types with stockings of 3
SPACE_MX	Spacing Mixwood	Reduction in stand density to enhance diameter growth (non-commerical). Types	Regen types with stocking levels
Plant_BS	Planting	Planting of softwood Species. Includes BS, JP, RP and WP	PLN, PLN1(JP), PLN2 (PI)
*Note: Coding corresponds with *ACTION in Woodstock Action file.			

The above table lists the actions that were used in the WOODSTOCK model to produce the aspatial/spatial plan. The partial cut and commercial thin actions were constrained for levels that were deemed operational on the license. The tolerant hardwood and tolerant hardwood-softwood partial cuts were designed with the Tolerant Hardwood guidelines from DNRE in mind. The cedar partial cut was a suggestion from Region 2 DNRE in an effort to help promote cedar regeneration on the License.

Due to concerns with thirty-meter buffers and their stability, only 60 and 100 meter buffers were targeted for potential harvest. Out of these, only certain stand types were chosen for such harvests. These consisted mostly of softwood and mixed-wood types (BFN, BSH, PF, JPN, PS, SF, SPN, BF2, BF3 and SW3).

2.5 Post Treatment Regeneration Response

When a stand is treated within the model, a response to that treatment must be defined. By assigning a yield curve to this transition this response can be tracked not only for timber but non-timber values as well. An example of this would be a Black Spruce stand being clear-cut. The area would be broken down into various portions and each portion would go to a different curve. Part of this area may go to a Black Spruce regenerating curve (BS1), while another part may be set-aside for planting. The transition matrix describes how these transitions will take place within the model. The transition matrix for clear-cutting was defined by the Forest Management Branch of DNRE. However, not all treatments on the License are clear-cutting. Partial cuts and commercial thins must transition from one state to another and are accounted

for. Since there is a lack of data on these types of harvests some assumptions have to be made. In the case of partial cuts and commercial thins it is assumed a quantity of volume is removed and the yield is adjusted to a new transition.
Silviculture transitions must also be defined and assigned yield curves within the model. A stand, which is cut and transitions to a regeneration curve may later be eligible for pre-commercial thinning. Another stand when cut might transition for eligibility for planting and shortly afterwards transition to a planting curve. Generally future vegetative concerns, timber or some other habitat considerations might drive the type of planting. In some cases however, the type of planting has been determined before hand. After consulting with DNRE Region 2, Jack Pine stands that were clear-cut harvested would transition to a Jack Pine plantation curve. The rationale behind this was that those stand types are only suitable sites for Jack Pine plantation. A similar situation is the case for Pine stands within the forest. In this case though the model could choose between white pine and red pine to be planted. The major concern here was for future vegetative community constraints.

Table 2.2 Treatment Response Matrix

	% of Postcut Community											
PRECUT	BF1	BF2	BF3	BS1	EC1	HW3	HW4	PF2	PF3	SW3	PLN	PLOTS
BS24	16	12	13	24	2	5	3	11	5	4	5	74
SW24	8	15	5	5	2	15	15	10	17	5	3	80

The BS24 grouping is comprised of the Black Spruce (BS) and Spruce (SP) vegetative communities. The SW24 is comprised of Balsam Fir (BF), Hardwood (HW), Other softwood (OS), and Eastern Cedar (EC). As was mentioned above Jack Pine and Pine were separated from these and given their own transitions. Tolerant Hardwood-Softwood and Pure Tolerant Hardwood were also separated from the clear-cut matrix. This was done since these stand types are not eligible for clear cut and must follow the Tolerant Hardwood guidelines.
As you can see in Table 2.2 above each of the regeneration curves, except planting (PLN), have a number applied to them. This number indicates their stocking classes and delineates what type of pre-commercial thinning that regeneration curve could later transition to. Stocking 1 means that regeneration curve can be pre-commercially thinned to softwood. Stocking 2 is a little more flexible and will allow the regeneration curve to either be pre-commercially thinned to softwood or mixed-wood. Stocking level 3 will allow for pre-commercial thinning to softwood, mixed-wood or hardwood stand types. Stocking level 4 will allow a regeneration curve to be thinned to a hardwood condition.

3.0 General Forest

The General Forest comprises 78% (48003 ha) of the productive land base on the Kent License. This is part of the forest, which is not subject to non-timber objectives such as OSFH, DWA, and Buffer zone maintenance, essentially the unconstrained forest. The General Forest is required to maintain a gross level of OSFH from Period 8, or 40 years, to the end of the planning horizon.

3.1 Objectives

Thus the primary objective of the General forest is to determine the maximum sustainable harvest level that can be maintained over a 80-year planning horizon. However, the General Forest although not actively managed for non-timber objectives, constantly provides habitat for many species not typically associated with DWA and OSFH objectives. Vegetative Communities are managed for within the General Forest, but spatially no blocking is needed for these. A level of Gross OSFH must be maintained upon the whole License, which the General Forest does contribute to. The General Forest is managed for timber production within the guidelines specified in the Forest Management Manual. For modeling purposes the entire General forest can be managed as a whole. However, numerous parts of the General Forest may have different guidelines for management.

3.2 Silviculture Impacts on Annual Allowable CUT (AAC)

Table 3.1. Immediate increases in Spruce, Fir, and Jack Pine AAC that are possible using various silviculture levels on License 5 (non-spatial results)

Planting	Spacing					
	0	1000	2000	3000	3500	4000
0	235000	290000	322000	339000	342000	342000
100	240000	293000	324000	340000	343000	343000
200	245000	297000	327000	341000	344000	344000
300	248000	300000	329000	342000	344000	345000
400	250000	302000	332000	343000	345000	345000
500	251000	304000	333000	343000	345000	345000

Silviculture (planting and spacing) has a positive impact on sustainable harvest levels. In order to determine the allowable cut effect (ACE), those harvesting actions that are affected by silviculture on the license were used. Those actions being clear cutting and commercial thinning. Partial cuts in natural stands have no effect on silviculture and were not used in this determination. Table 3.1 above shows that with no spacing or planting the license can sustain 235000 m^3/period or 47000 m^3/year of Spruce, Fir and Jack Pine. However, with the use of silviculture a point of maximum return can be reached at 3500 ha/period (700 ha/year) of spacing and 400 ha/period (80 ha/year) of planting. Beyond this point, the AAC will not respond to silviculture, giving a maximum of 345000 m^3/period or 69000 m^3/year of spruce, fir and jack pine.

It should be noted that when this procedure was performed, it did not include the proposed protected area. This area is no longer included in the operable land base of the license.

Table 3.2 Immediate increases in hardwood AAC that are possible using various pre-commercial thinning levels on License 5 (non-spatial results)

Hardwood	
	Spacing
0	142000
1000	148000
2000	151000
3000	152000
3500	152000
4000	152000

Silviculture can also have an effect on hardwood AAC as well. The silviculture practices, which most affect this, is spacing. No planting of hardwoods take place on the license, so planting was turned off and not considered for this. With no spacing, the entire license could support a sustainable level of 142000 m^3/period or 28400 m^3/year of hardwood. The point where no more hardwood AAC can be obtained is at 3000 ha/period or 600 ha/year. At that point the AAC for hardwood is 152000 m^3/period or 30400 m^3/year.

3.3 Sustainable Harvest Levels (General Forest)

The modeling software Woodstock was used to model License 5 in order to generate the above volumes. An even flow harvest was constrained for softwood and hardwood, with varying levels of silviculture to take place over the 80-year plan. Habitat constraints for OSFH, SP, PI, and JP were placed on the model for habitat considerations. Other habitats were not needed to be constrained for. Once done and approved by DNRE, blocking of the forest was preformed to determine the sustainable spatial timber supply in the General Forest. This was done using STANLEY and manual blocking afterwards to determine the blocking for the plan. The blocking scheme was fed into the model, along with the proposed DWA and OSFH management activities, to report on the spatial scheme but also to make sure all constraints for habitat and vegetative communities would be met. The Period 1 estimates of the spatial timber supply can be seen in Table 3.3. Since the Spatial and Aspatial differ some due to blocking considerations, silviculture levels changed somewhat from the aspatial. These levels are further discussed in Section 3.5.

Table 3.3 Summary of 2002-2026 Spatial harvest (m^3/year) for License 5

Landbase	Primary Volume & Fallout			
	Spruce, Fir & Jack Pine (m^3/yr)	Hardwood (m^3/yr)	Cedar (m^3/yr)	Pine (m^3/yr)
General Forest	40174	20404	3776	2144
DWA	1656	1061	26	50
OSFH	555	1231	0	14
Buffers	156	189	6	7
Total	42541	22885	3808	2215

3.4 Summary of Harvest Treatments (General Forest)

Several types of harvest treatments were available for the use of the model for determining a sustainable harvest. The descriptions of these treatments can be found in Table 2.1. The main treatment type on License 5 is that of clear cutting. This includes clear cutting of natural softwood and hardwood types, with the exception of tolerant hardwood types. Plantations and pre-commercial thins are also modeled for clear cutting and are considered to be part of the "managed" forest. Other harvest treatments include commercial thinning of plantations and pre-commercial thins. These stand types are considered to be "managed" and are performed to capture some volume early on. Commercially thinned plantations and pre-commercial thins can be clear-cut several periods after the initial commercial thin. The summary of the harvest treatments for Spruce-Fir and Jack Pine blocked on License 5 for the period between 2002-2026 can be seen in Table 3.4. The summary of the blocked hardwood volumes harvested is in Table 3.5, while the over all area treated can be found in Table 3.6.

3.4.1 Harvest Volume Net Down & Blocking Strategy

Harvest blocking was achieved through the use of the spatial blocking program STANELY and professional field experience. The blocking rules set out by the Department of Natural Resources and Energy were followed in the formulation of the spatially blocked plan. Some of these rules were no greater than 100 ha clear cuts, 200 meter buffer between same period blocks, 2 period delay between adjacent blocks, etc. Blocks were "squared up" were possible and land base features allowed. This left some blocks with a more regular shape than others would. This blocking was carried out on the General Forest and not upon the DWA, OSFH and buffers. Blocking for these areas are discussed in later sections.

It should be noted that a 10% operational net-down was applied to the harvested volumes. This applies to the harvested volumes for all volume coming off the General Forest, DWA, OSFH and buffers. Due to additional concerns with the accessibility of cedar, cedar was netted down by 35%, not 10%. The volumes represented in Tables 3.4, 3.5, 3.8 and 3.9 are the net-down volumes for License #5.

Allocations set forth by DNRE for cedar and pine are determined on log volume. The volumes reported within the plan are for total volume. However, an estimated log volume percentage for

Pine would be 80 %. Cedar quality is low on License #5, made of pulp and fencing material and it is believed that 65% of the total volume could be allocated.

Table 3.4. Summary of Spatial Spruce, Fir, Jack Pine harvest volumes on License 5

Period	Mgt Unit	Total Harvest			Harvest from Unmanaged Natural Stands						Harvest from Managed Stands					
					Clear Cut			Partial Cuts			Clear Cut			Commercial Thins		
		m3	m3/ha	% of Total Volumes	m3	m3/ha	% of Total Volumes	m3	m3/ha	% of Total Volumes	m3	m3/ha	% of Total Volumes	m3	m3/ha	% of Total Volumes
1	Gen For	196630	51	100	196238	52	99.8	392	8	0.2	0	0	0	388	9	0.2
	Deer	8282	45	100	8282	45	100	0	0	0	0	0	0	0	0	0
	OSFH	2776	32	100	2776	32	100	0	0	0	0	0	0	0	0	0
2002-2006	Buffer	759	13	100	0	0	0	759	13	100	0	0	0	0	0	0
2	Gen For	203420	53	100	201850	55	99.2	806	8	0.4	96	72	0.05	668	11	0.3
	Deer	3716	46	100	3716	46	100	0	0	0	0	0	0	0	0	0
	OSFH	2510	35	100	2510	35	100	0	0	0	0	0	0	0	0	0
2007-2011	Buffer	578	12	100	0	0	0	578	12	0	0	0	0	0	0	0
3	Gen For	194454	51	100	188195	56	97	661	8	0	0	0	0	5617	12	3
	Deer	8042	64	100	8042	64	100	0	0	0	0	0	0	0	0	0
	OSFH	2609	25	100	1919	46	74	690	12	26	0	0	0	0	0	0
2012-2016	Buffer	755	15	100	0	0	0	755	15	100	0	0	0	0	0	0
4	Gen For	203016	51	100	194475	56	95.8	354	11	0	1110	100	0.5	7076	12	3.5
	Deer	7200	84	100	7200	84	100	0	0	0	0	0	0	0	0	0
	OSFH	1543	33	100	1543	33	100	0	0	0	0	0	0	0	0	0
2017-2021	Buffer	1075	18	100	0	0	0	1075	18	100	0	0	0	0	0	0
5	Gen For	219910	52	100	205170	59	94.2	1112	9	0.5	2084	96	1.2	8943	11	4.1
	Deer	2205	29	100	2205	29	100	0	0	0	0	0	0	0	0	0
	OSFH	2081	80	100	2081	80	100	0	0	0	0	0	0	0	0	0
2022-2026	Buffer	742	15	100	0	0	0	742	15	100	0	0	0	0	0	0
Total	Gen For	1017657	52	100	966745	56	97.1	3343	8	0.3	3691	96	0.4	22691	13	2.2
	Deer	29446	54	100	29446	54	100	0	0	0	0	0	0	0	0	0
	OSFH	11519	35	100	10829	40	94	690	12	6	0	0	0	0	0	0
2002-2026	Buffer	3910	15	100	0	0	0	3910	15	100	0	0	0	0	0	0
AAC Period Average	Gen For	203534	52	100	193749	56	97.1	669	8	0.3	738	96	0.4	4538	13	2.2
	Deer	5889	54	100	5889	54	100	0	0	0	0	0	0	0	0	0
	OSFH	2304	35	100	2166	40	94	138	12	6	0	0	0	0	0	0
2002-2026	Buffer	782	15	100	0	0	0	782	15	100	0	0	0	0	0	0

- The bottom row of Table 3.4 represents the Allowable Cut per Period on Crown License #5.

Table 3.5. Summary of Spatial hardwood harvest volumes on License 5

Period	Mgt Unit	Total Harvest			Harvest from Unmanaged Natural Stands						Harvest from Managed Stands					
					Clear Cut			Partial Cuts			Clear Cut			Commercial Thins		
		m^3	m^3/ha	% of Total Volumes	m^3	m^3/ha	% of Total Volumes	m^3	m^3/ha	% of Total	m^3	m^3/ha	% of Total Volumes	m^3	m^3/ha	% of Total
1	Gen Hdr	119077	30	100	118539	31	99.1	1034	19	0.9	0	0	0	47	11	0.04
	Deer	5306	29	100	5306	29	100	0	0	0	0	0	0	0	0	0
	OSFH	6153	72	100	6153	72	100	0	0	0	0	0	0	0	0	0
2002-2006	Buffer	1009	18	100	0	0	0	1009	18	100	0	0	0	0	0	0
2	Gen Hdr	112756	29	100	108614	31	97.6	2587	25	2.3	10	8	0.01	66	12	0.1
	Deer	5029	62	100	5029	62	100	0	0	0	0	0	0	0	0	0
	OSFH	5761	81	100	5761	81	100	0	0	0	0	0	0	0	0	0
2007-2011	Buffer	1187	25	100	0	0	0	1187	25	0	0	0	0	0	0	0
3	Gen Hdr	103916	27	100	101308	31	97	2496	25	2	0	0	0	389	12	1
	Deer	3571	29	100	3571	29	100	0	0	0	0	0	0	0	0	0
	OSFH	2931	29	100	1639	39	56	1292	22	44	0	0	0	0	0	0
2012-2016	Buffer	1011	20	100	0	0	0	1011	20	100	0	0	0	0	0	0
4	Gen Hdr	102527	25	100	101239	30	98.7	955	17	1	120	11	0.1	676	12	0.7
	Deer	1651	19	100	1651	19	100	0	0	0	0	0	0	0	0	0
	OSFH	770	16	100	770	16	100	0	0	0	0	0	0	0	0	0
2017-2021	Buffer	484	8	100	0	0	0	484	8	100	0	0	0	0	0	0
5	Gen Hdr	93535	22	100	89121	28	95.3	3206	25	3.4	276	10	0.3	1203	2	1.3
	Deer	3776	50	100	3776	50	100	0	0	0	0	0	0	0	0	0
	OSFH	237	9	100	237	9	100	0	0	0	0	0	0	0	0	0
2022-2026	Buffer	1023	20	100	0	0	0	1023	20	100	0	0	0	0	0	0
Total	Gen Hdr	532213	27	100	519810	30	97.7	9404	23	1.8	406	10	0.1	2380	2	0.5
	Deer	19333	35	100	19333	35	100	0	0	0	0	0	0	0	0	0
	OSFH	15851	48	100	14559	54	92	1292	22	8	0	0	0	0	0	0
2002-2026	Buffer	4714	18	100	0	0	0	4714	18	100	0	0	0	0	0	0
AAC / Period	Gen Hdr	106443	27	100	103962	30	97.7	1881	23	1.8	81	10	0.1	476	2	0.5
Average	Deer	3867	35	100	3867	35	100	0	0	0	0	0	0	0	0	0
	OSFH	3170	48	100	2912	54	92	258	22	8	0	0	0	0	0	0
2002-2026	Buffer	943	18	100	0	0	0	943	18	100	0	0	0	0	0	0

- The bottom row of Table 3.5 represents the Allowable Cut per Period on Crown License #5.

Table 3.6. Summary of Spatial harvest area on License 5

Period	Mgt Unit	Total Harvest		Harvest from Unmanaged Natural Clear Cut		Partial Cuts		Harvest from Managed Stands Clear Cut		Commercial Thins	
		Hectares	% of Total Area	Hectares	% of Total Area	Hectares	% of Total Area	Hectares	% of Total Area	Hectares	% of Total Area
1	Gen For	3956	100%	3,859	98	55	1	0	0	42	1
	Deer	182	100%	182	100	0	0	0	0	0	0
	OSFH	85	100%	85	100	0	0	0	0	0	0
2002-2006	Buffer	56	100%	0	0	56	100	0	0	0	0
2	Gen For	3826	100%	3,662	95.7	104	3	1	0.04	59	1.54
	Deer	81	100%	81	100	0	0	0	0	0	0
	OSFH	71	100%	71	100	0	0	0	0	0	0
2007-2011	Buffer	48	100%	0	0	48	100	0	0	0	0
3	Gen For	3786	100%	3225	85	82	2	0	0	479	13
	Deer	125	100%	125	100	0	0	0	0	0	0
	OSFH	103	100%	42	41	60	59	0	0	0	0
2012-2017	Buffer	50	100%	0	0	50	100	0	0	0	0
4	Gen For	3971	100%	3347	84	32	1	11	0	580	15
	Deer	86	100%	86	100	0	0	0	0	0	0
	OSFH	47	100%	47	100	0	0	0	0	0	0
2018-2021	Buffer	59	100%	0	0	59	100	0	0	0	0
5	Gen For	4182	100%	3487	83	128	3	27	1	540	13
	Deer	75	100%	75	100	0	0	0	0	0	0
	OSFH	26	100%	26	100	0	0	0	0	0	0
2022-2026	Buffer	51	100%	0	0	51	100	0	0	0	0
Total	Gen For	19721	100%	17581	89	400	2	40	0.2	1700	9
	Deer	548	100%	548	100	0	0	0	0	0	0
	OSFH	332	100%	272	82	60	18	0	0	0	0
2002-2026	Buffer	263	100%	0	0	264	100	0	0	0	0
avg	Gen For	3944	100%	3516	89	80	2	8	0.2	340	9
	Deer	110	100%	110	100	0	0	0	0	0	0
	OSFH	66	100%	54	82	12	18	0	0	0	0
	Buffer	53	100%	0	0	53	100	0	0	0	0

3.5 Summary of Silviculture Treatments

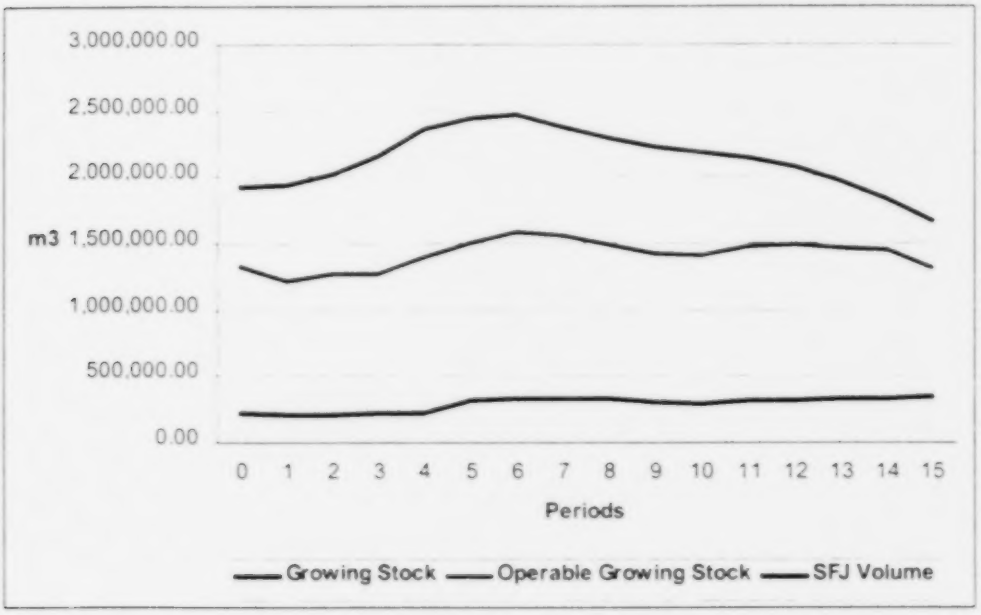
Based on the final spatial strategy License 5 the silviculture levels as illustrated in Table 3.7 are 110 ha/year of planting and 600 ha/year of pre-commercial thinning for Period 1.

Table 3.7. Total silviculture levels required to support spatial harvest levels.

Period	Plantations	Softwood thinning	Mixed wood thinning	Hardwood thinning	Total
1	110	47	545	7	710
2	85	117	483	0	685
3	111	36	668	0	815
4	96	116	584	0	796
5	86	273	427	0	786

3.6 Operable Growing Stock
3.6.1 Softwood Growing Stock

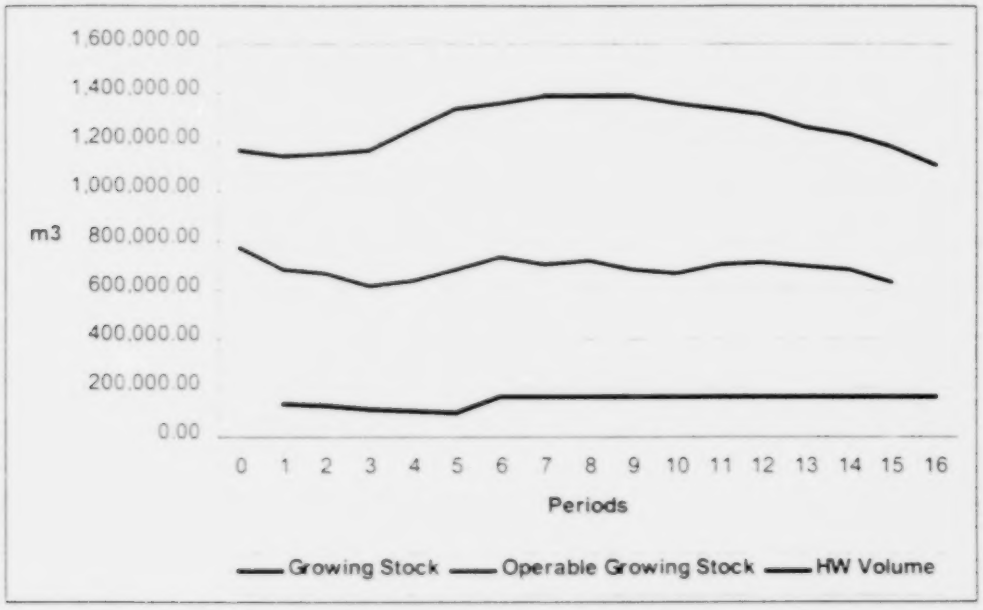
Figure 3.1 Spruce, Fir & Jack Pine operable growing stock & sustainable harvest level over the 80-year planning horizon on License 5 (spatial)



The Spruce, Fir, Jack Pine operable growing stock over the planning horizon is proportionally much higher than the annual harvest. There are several reasons for this difference. First is that after 40 years, 7800 hectares of old spruce-fir habitat must be maintained on the License. These older stands would have high percentages of softwood within them, and though restricted from harvesting would contribute to the operable growing stock. Another possible contributing factor would be the vegetative community objectives. Vegetative communities such as Black Spruce (BS), Jack Pine (JP), Pine (PI), Eastern Cedar (EC) and Spruce (SP) must be maintained on the License. While being maintained, they would also contribute towards the operable growing stock, although they might not be eligible to harvest.
The low point for the License takes place in 10 years (Period 2) and helps determine the immediate sustainable AAC. It should be noted that the wood in the Black River Protected Area would not contribute to the operable growing stock, since that area is not considered for any harvesting activities.

3.6.2 Hardwood Growing Stock

Figure 3.2 Hardwood operable growing stock & sustainable harvest level respecting all of the forest management plan objectives over the 80-year planning horizon on License 5 (spatial)



The hardwood operable growing stock over the planning horizon is proportionally much higher than the annual harvest. Some reasons for this is the high percentage of hardwood in the regeneration curves, hardwood within the OSFH, LMWH, OMWH and OHWH habitat types.

The low point determining the immediate sustainable AAC does not take place until Period 4 or 20 years into the plan time-line.

3.7 Softwood Dominated Strata

3.7.1 Objectives

The primary objective for the softwood-dominated strata is to determine the maximum sustainable harvest level that can be maintained over an 80-year planning horizon. The AAC will be achieved by harvesting the oldest and fastest declining stands first while simultaneously determining the levels of planting and spacing required. This management objective is only met once the non-timber objectives have first been satisfied which are set out in " A Vision for the New Brunswick Forests...Goals and Objectives for Crown Land Management".

3.7.2 Harvest Prescriptions

The softwood dominated strata is primarily composed of both mature and over-mature wood, with a large component in the younger age classes. This can bee seen in Figure 2.4 showing the age classes on the License. In these younger age classes, much of the area is not yet available for alternative harvesting treatments like commercial thinning. Thus, clear cutting is the primary harvest method in these strata. However, the opportunity to use commercial thinning in softwood plantations and pre-commercial thins increases in the future.
The primary volume to come out of these strata, by management unit, is the Spruce, Fir & Jack Pine volume. The spatially blocked volume produced can be seen in Table 3.4.

3.8 Hardwood Dominated Strata

3.8.1 Objectives

The primary objective for the hardwood-dominated strata is to determine the maximum sustainable harvest level that can be maintained over an 80-year planning horizon. An even flow harvest constraint was applied to these to ensure a sustainable harvest. These strata encompass both Intolerant Hardwood dominated strata and Tolerant Hardwood dominated strata. The Department of Natural Resources and Energy requires that pure tolerant hardwood stands exhibiting potential for sawlogs/veneer are managed using selection or un-evenaged management harvest techniques. These stands were modeled under the tolerant hardwood guidelines. However, due to the limited amount of quality tolerant hardwood stands these harvesting techniques were constrained for in the model. During blocking each is managed for differently and their own objectives.

3.8.2 Harvest Prescriptions

3.8.2.1 Intolerant Hardwood Dominated Strata

The intolerant hardwood dominated strata will be managed for even-age with a clear-cut harvest. This includes intolerant hardwood pre-commercial thins. It was also determined that some of these intolerant hardwood pre-commercial thins could be eligible for commercial thinning. These types' being the intolerant hardwood/ Balsam Fir and Intolerant Hardwood/Spruce pre-commercial thins. The hardwood volumes produced from these can be seen in Table 3.5.

3.8.2.2 Tolerant Hardwood Dominated Strata

Due to the Tolerant Hardwood guidelines, the tolerant hardwood or tolerant hardwood/softwood strata were to be managed through selection harvesting. The objective being to harvest quality sawlogs and or veneer from these stand types. This selection harvest consists of a 30% removal of the total volume. During the blocking phase, these stands designated for such treatments were chosen based on professional knowledge. The spatially blocked hardwood volumes can be found under Partial Cut category on Table 3.5 for each management unit.
Under the Tolerant Hardwood guidelines, tolerant hardwood or tolerant hardwood/softwood stands which are five hectares or less can be designated for a clear-cut prescription. Some of these stands which were present within the harvest blocks were designated for this prescription. Some stands which were bigger than 5 hectares were pre-cut cruised and were found not to be of sufficient quality and/or species type (i.e. were predominately Red Maple) and were prescribed to be clear-cut.

3.9 Cedar Dominated Strata

3.9.1 Objectives

Cedar forms a relatively minor component of the License 5 forest. The objective was to maintain or enhance the cedar levels set out by "A Vision for the New Brunswick Forests...Goals and Objectives for Crown Land Management". This will be discussed in Section 9.1. Cedar is mainly a fallout volume.

3.9.2 Harvest Prescriptions

Clear-cutting was chosen as the primary harvest activity for cedar stands on License 5. However, on suggestion from DNRE Region 2, a partial harvest was modeled for encouraging cedar regeneration. This partial harvest comprises a 40% removal of volume, done in strip cuts. The aspatial model however, did not utilize this method much and it was not blocked during the blocking phase. The cedar volumes and fallout for each management unit can be seen in Table 3.8. Clear cuts would encompass all clear cuts from natural stands or managed stands.

Table 3.8 Summary of Spatial Cedar harvest volumes on License 5

Period	Mgt Unit	Total Harvest	Harvest from Natural		Harvest from Managed	
			Clear Cut	Partial Cut	Clear Cut	Commercial Thins
		m3	m3	m3	m3	m3
1	Gen For	19874	19834	40	0	0
	Deer	128	128	0	0	0
	OSFH	0	0	0	0	0
2002-2006	Buffer	3	0	3	0	0
2	Gen For	20335	20185	140	0	11
	Deer	89	89	0	0	0
	OSFH	23	23	0	0	0
2007-2011	Buffer	8	0	8	0	0
3	Gen For	13629	13693	96	0	39
	Deer	259	259	0	0	0
	OSFH	138	0	138	0	0
2012-2016	Buffer	7	0	7	0	0
4	Gen For	24114	23957	57	0	100
	Deer	109	109	0	0	0
	OSFH	535	535	0	0	0
2017-2021	Buffer	123	0	123	0	0
5	Gen For	15571	15070	263	52	126
	Deer	6	6	0	0	0
	OSFH	81	81	0	0	0
2022-2026	Buffer	7	0	7	0	0
Total	Gen For	93663	92738	596	52	275
	Deer	592	592	0	0	0
	OSFH	777	639	138	0	0
2002-2026	Buffer	148	0	148	0	0
AAC Average	Gen For	18733	18548	720	10	55
	Deer	118	118	0	0	0
	OSFH	155	128	28	0	0
2002-2026	Buffer	30	0	30	0	0

3.10 Pine Dominated Strata

3.10.1 Objectives

Pine forms a relatively minor component of the License 5 forest. The objective was to maintain or enhance the Pine levels set out by "A Vision for the New Brunswick Forests...Goals and Objectives for Grown Land Management".

3.10.2 Harvest Prescription

Clear-cutting was chosen as the primary harvesting technique for Pine stands on License 5. Planted Pine (either Red or White Pine) could be commercially thinned if opportunity arose in the future. The summary of Pine volumes and fallout is illustrated in Table 3.9.

Table 3.9 Summary of Spatial Pine harvest volumes on License 5

Period	Mgt Unit	Total Harvest	Harvest from Natural Stands		Harvest from Managed	
			Clear Cut	Partial Cut	Clear Cut	Commercial Thins
		m3	m3	m3	m3	m3
1	Gen For	15795	15763	21	0	12
	Deer	252	252	0	0	0
	OSFH	72	72	0	0	0
2002-2006	Buffer	28	0	28	0	0
2	Gen For	6995	6949	29	2	15
	Deer	108	108	0	0	0
	OSFH	247	247	0	0	0
2007-2011	Buffer	23	0	23	0	0
3	Gen For	10856	10747	20	0	90
	Deer	193	193	0	0	0
	OSFH	2369	2325	44	0	0
2012-2016	Buffer	23	0	23	0	0
4	Gen For	6129	5837	31	30	231
	Deer	144	144	0	0	0
	OSFH	2346	2346	0	0	0
2017-2021	Buffer	25	0	25	0	0
5	Gen For	7080	6648	62	142	228
	Deer	1462	1462	0	0	0
	OSFH	1171	1171	0	0	0
2022-2026	Buffer	70	0	70	0	0
Total	Gen For	46855	45944	162	174	576
	Deer	2159	2159	0	0	0
	OSFH	6205	6161	44	0	0
2002-2026	Buffer	170	0	170	0	0
AAC	Gen For	9371	9189	32	35	115
Average	Deer	432	432	0	0	0
	OSFH	1241	1232	9	0	0
2002-2026	Buffer	34	0	34	0	0

4.0 Old Spruce-Fir Forest Habitat

4.1 Objectives and General Description

Within the Province of New Brunswick, twenty-five birds and four mammals depend on, or strongly prefer mature and over-mature softwood forest to provide the necessities of life. Objectives for OSFH have been set out in "A Vision for the New Brunswick Forests...Goals and Objectives for Crown Land Management" to help meet this need on the Crown Land in New Brunswick.

4.1.1 Background

For individual stands to be considered for OSFH stands, they must fall within specific criteria. They must be of a specific stand type, age range and be situated spatially to form contiguous blocks of mature softwood forest. These types of stands that are considered to be part of OSFH block areas and are part of the Net OSFH area. Stands out side of these areas contribute to the overall Gross OSFH levels for the license.

Gross OSFH

Yield curves are used to track volume for each stratum on the License. DNRE Fish and Wildlife Branch assessed these yield curves for potential OSFH. Those that were acceptable had a habitat window assigned to them based on rules set out by Fish & Wildlife Branch of the Department of Natural Resources & Energy.

Net OSFH

In order to be considered part of the Net OSFH landbase, these stands must meet the aspatial criteria set out by Fish & Wildlife Branch, plus be suitably arranged spatially to form contiguous blocks. The spatial criteria for Net OSFH is:

- OSFH Blocks should contain greater than or equal to 375 hectares of stands meeting the OSFH stand level habitat
- A minimum of 75% of the OSFH block should be of stands that meet the habitat criteria.
- OSFH block width must normally exceed 1000 meters and always exceed 500 meters.

4.1.2 OSFH Objectives

The Net OSFH objective was set out in "A Vision for the New Brunswick Forests...Goals and Objectives for Crown Land Management", which is equal to 3950 hectares. As part of the planning process the Gross OSFH objective must also be calculated and it was determined to be 7800 hectares (see Section 4.3 for the calculations). This gross level must be maintained upon the entire License after Period 8, or 40 years, to the end of the planning horizon.

4.2 OSFH Management Strategy

During the 1997 Management Plan formulation, Mature Coniferous Forest Habitat (MCFH) was one of the constraints on License 5. Since then, MCFH has become modified and developed into Old Spruce – Fir Habitat (OSFH) by Fish & Wildlife Branch, DNRE. For the 2002 Management Plan formulation License 5, DNRE Region 2 and Fish & Wildlife Branch assessed the 1997 MCFH blocks for availability of OSFH stands. Not all of the old MCFH blocks conformed to the new OSFH criteria. Some of the MCFH blocks were moved back into the General Forest, while some of the old MCFH blocks were expanded. This gave License 5 major OSFH blocks totaling 4452 hectares. With the current layout of the OSFH blocks there is no over lap with the Deer Wintering Areas on the License. The License 5 land base is highly fragmented, with older stands being scattered throughout the License. This makes it difficult to find contiguous stands, which contribute, to OSFH. This makes it difficult to achieve the spatial objective for OSFH within the OSFH blocks.

It should be noted that the Black River Protected Area does contribute to the gross OSFH level for the License. Though no management activities are allowed in this area, the present stands contribute towards OSFH now and in the future. By adding the OSFH level from the Protected Area to the OSFH available from the OSFH blocks, Table 4.2, the OSFH objective can be eventually achieved.

4.2.1 Net OSFH and Wood Supply Summary

Clear-cut and partial cut harvesting are proposed in the OSFH blocks. This timber harvesting does not reduce the OSFH within the OSFH blocks, except for Periods 6 and 7. The percentage change for these periods is below 1%. This is mainly due to targeting stands that do not contribute to OSFH for harvesting. The volumes to be harvested were lowered for the first period to levels License 5 believed could be achieved operationally. These stands will be spatially blocked, once pre-cut evaluations can be made to determine that such stands to be harvested do not fit the OSFH criteria. Table 4.1 shows the breakdown of OSFH within each of the OSFH blocks plus the over all aspatial potential harvest from these blocks. Individual summaries of each OSFH block can be found in Appendix 5.

Table 4.1 Old Spruce-Fir Habitat block Summary & aspatial timber harvest Estimates for License 5 for the next 35 years

Old SF Habitat Objective by Eco-Region		OSFH Block #	Total Block Area (ha)	Old SF Habitat (ha) by 5 Year Management Period						
				1	2	3	4	5	6	7
6	3950	OSFH583501	828	504	548	568	610	619	632	636
		OSFH583001	1697	844	984	998	1192	1354	1371	1386
		OSFH583301	588	376	423	423	457	457	457	457
		OSFH603301	836	461	501	507	493	584	621	599
		OSFH603601	503	311	363	363	368	375	375	377
License 5 Totals (Gross Level OSFH (ha))				11073	11429	10244	9659	8936	7247	7181
OSFH (ha) in OSFH Blocks (Non-Intervention)				2497	2819	2859	3120	3389	3460	3462
OSFH (ha) in OSFH Blocks (Intervention)		Objective 3950		2497	2819	2859	3120	3389	3456	3456
% of Objective		After intervention		63%	71%	72%	79%	86%	87%	87%
Aspatial Harvest Level (m3) (unnetted)				10000	9500	9000	6000	4000	5182	4269

The estimate of the aspatial harvest from the OSFH blocks is 10,000 m^3 in Period 1. This breaks down to approximately 3200 m^3 of softwood and 6800 m3 of hardwood for Period 1. As the timeline progresses the harvest falls off going as low as 4269 m^3 in Period 7. Though clear-cutting is the primary harvesting technique, in period 3 some 60 hectares are partially cut. The volumes shown are non-net down levels. Netted down levels for OSFH can be seen in Tables 3.4, 3.5, 3.8 and 3.9.

Table 4.2 Old Spruce-Fir Habitat Summary of the Black River Protected Area and Percentage of Blocked OSFH (Including OSFH Blocks & Protected Area)

	1	2	3	4	5	6	7
Protected Area (OSFH Level in ha)	1031	1175	1185	1224	1277	1302	1344
% of Objective: (PA & OSFH Blocks)	89	101	102	109	118	120	121

4.3 Gross OSFH Objective and Supply

The Gross OSFH objective is the level of OSFH that must be maintained on License 5 from Period 8, till the end of the planning horizon. This level is calculated with the following formula:

Gross Objective = to the Net Objective multiplied by the ratio of the Gross: Net OSFH found at the lowest period in the first 35 years where the Gross OSFH is lowest on the License.

Gross/Net OSFH Ratio = Minimum Gross OSFH level in first 35 years/ Net OSFH for the same period

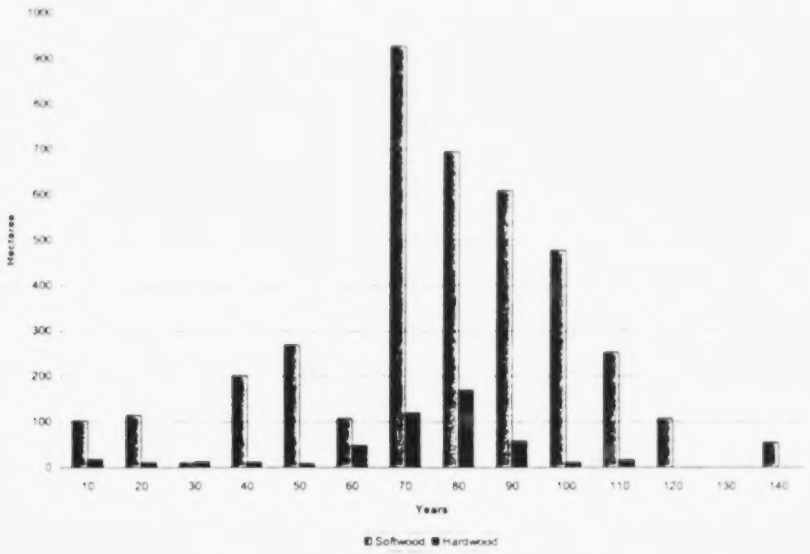
Gross/Net OSFH Ratio = 6811 ha (P5) / 3384 ha (P5)
= 2

This ratio once calculated is multiplied by the Net Objective to give the Gross Objective for the License. The ratio at the lowest point is equal to 2, thus the Gross Objective for License 5 is 7800 hectares (3950 ha * 2). Table 9.1 in Section 9.1 shows the Gross Level of OSFH on the License for the planning horizon. From Period 8, 10 - 12 the OSFH Gross objective is exceeded and then merely met at Period 9, and then from Periods13 to 16.

4.4 Age Class Structure for the OSFH

A large portion of the age class structure is over the age of 60 years. Sixty years of age is the lowest start of an OSFH window on License 5. However, from 60 years on, the level of older softwood stands begins to drop off after 70 years. This can be seen in Figure 4.1. There is also a small portion of stands within the younger age classes. Approximately 17% of the softwood area are in these lower age classes. This makes it difficult to maintain the OSFH net Objective within the OSFH blocks. The harvesting of non-habitat stands is primarily done so as to have these stands regenerate to habitat conditions in the future. Some silviculture may be used to improve regenerating stands to accomplish this.

Figure 4.1 Age Class Structure of OSFH Blocks on License 5



5.0 Deer Wintering Areas

5.1 Objectives

For those areas identified as Deer Wintering Areas on License 5 the management objective is to maximize a sustainable supply of Moderate Winter Deer Habitat (MWDH) while attempting to maintain Severe Winter Deer Habitat (SWDH) levels. This was attempted for the DWAs on License 5 and it was found that the MWDH could be improved within the DWA, but the eventual decline of MWDH can not be averted. This is due to as the similar situation with the OSFH land base. Due to the fragmentation of the forest, stands that meet the DWA criteria are not spatially grouped together contiguously.

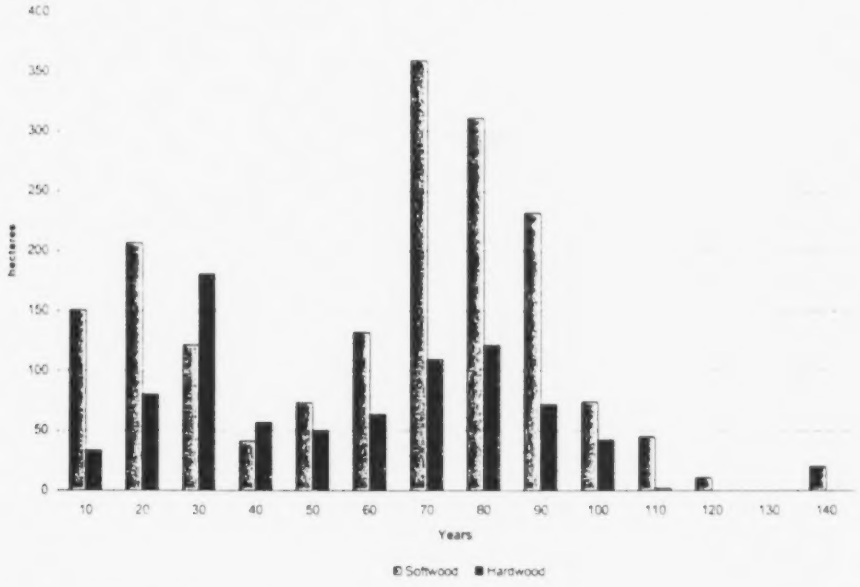
The Department of Natural Resources and Energy requires that each DWA that is to be managed actively have an individual management plan put in place. These individual plans will be created at a later date. However, License 5 has reduced the aspatial harvest for the DWA landbase to a level that was deemed operational, while maximizing the Moderate Winter Deer Habitat.

5.2 Landbase Description

The DWA landbase was designated by DNRE for the 1997-2001 Management Plan. These areas are located throughout the License, totaling some 2685 hectares. This area is broken down into 14 different DWAs on License 5. As can be seen in Figure 5.1 the majority of softwood stand types are in the older age classes. However, approximately 33% of the total

softwood DWA are located in the younger age classes (less than 60 years of age). Some intolerant hard wood-softwood mixed-wood types also provide MWDH, but the nearly half of the hardwood stand types are less than 60 years of age. These mixed-wood types of stand generally do not contribute to MWDH until much later ages.

Figure 5.1 Age Class of DWA Landbase on License 5



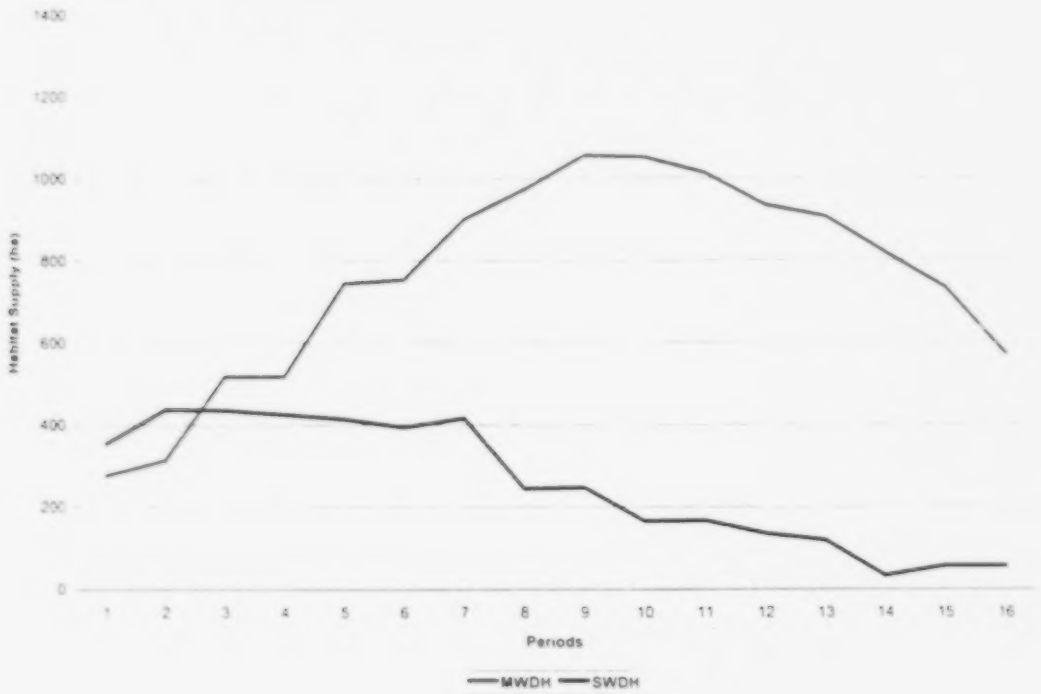
5.3 Habitat and Wood Supply

A comparison of non-intervention and intervention scenarios shows that both MWDH and SWDH can be improved by intervention. The projected MWDH is 940 hectares in period 16 in the intervention scenario as compared to 573 hectares in the non-intervention scenario. This is shown in Figures 5.2 and 5.3.

After lowering the harvest in the DWAs to an estimated operational level, while maintaining the maximized MWDH levels, the projected wood supply is 10,881 m^3 of softwood and 6033 m^3 of hardwood in Period 1. Some planting and pre-commercial thinning are done as well and projected levels can be seen in Table 5.1. The projected levels of harvesting in DWAs can be seen in Tables 3.5,3.6,3.8, and 3.9

In the1997 management plan License 5 agreed to do individual plans on 4 DWAs. These plans are currently being revised for the 1997 planning period and once done will be re-done for the 2002 management plan. Spatial blocking of harvests will take place then. These four DWAs are listed in Table 5.2.

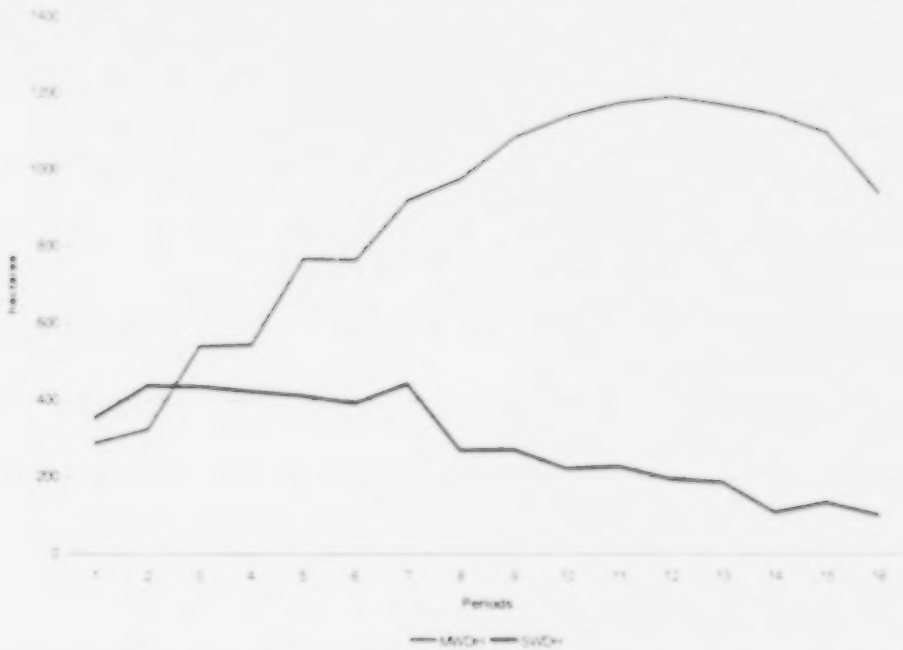
Figure 5.2. Projected moderate & severe winter habitat (MWDH, SWDH) supply and moderate/severe habitat factor from the License 5 DWA landbase without forestry interventions



	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
MWDH	276	312	517	517	743	752	900	971	1055	1051	1012	933	905	818	733	573
SWDH	353	436	434	424	413	393	415	243	246	164	166	134	118	31	56	56
M/S	1	1	1	1	2	2	2	4	4	6	6	7	8	26	13	10

In the non-forestry intervention scenario, moderate habitat begins to decrease near the end of the planning timeline. Severe Deer Winter habitat declines through out the planning horizon.

Figure 5.3. Projected moderate and severe winter deer habitat (MWDH, SWDH) supply and moderate severe habitat factor from the License 5 DWA landbase under the proposed management



	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
MWDH	287	323	539	542	766	764	918	975	1085	1140	1175	1190	1170	1145	1098	940
SWDH	353	436	434	421	410	390	441	269	270	221	226	193	185	107	132	100
M/S	1	1	1	1	2	2	2	4	4	5	5	6	6	11	8	9

In the forest intervention scenario, both moderate and severe habitats are increased over the timeline. There is still a decrease in both habitats, but the over all area of habitat is more than what is showing in the non-intervention scenario illustrated in Figure 5.2.

Table 5.1. Projected Silviculture Levels Per Year for DWAs (prior to Individual Plans)

Period	Planting	Softwood	Mixed Wood	Hardwood	Total
1	3	6	13	0	22
2	1	0	3	0	3
3	1	6	1	0	8
4	1	13	7	0	20
5	3	7	22	0	33

The average pre-commercial thinning done in DWAs during Period one is 19 ha/year, with 3 ha/year of planting for a total of 22 ha/year of silvilculture for the DWAs. Once individual plans are drawn up for the DWAs these levels may change.

Table 5.2. Deer Wintering Areas to be Managed under 2002-2006 Plan.

DWA Number	Area (ha)
DW603901	86
DW593701	247
DW593801	252
DW593601	97
Totals	682

6.0 Watercourse Buffers

In following with the guidelines set out by the Department of Natural Resources and Energy, all watercourses with a channel width of 0.5 meters and wider require a buffer strip to be established around them. These buffers are designated for the protection of water quality and aquatic habitat.

6.1 Objectives

Watercourses are of varying widths throughout the License and require different sized buffers on them. Watercourses are mapped in the provincial forest inventory and have different designations depending on their widths. These designations are single line streams, double line streams and named rivers. Accordingly these mapped streams and rivers have buffers applied to them in the forest inventory. As can be seen in Table 6.1, the buffer widths for License 5 are listed. These include buffer sizes for lakes and provincial highways as well.

Table 6.1 Mapped Buffer widths for License 5 and by Feature

2002 Buffer Widths (metres) by Feature					
License	Single Line Streams	Double Line Streams	Rivers	Lakes	Provincial Highways
5	37	76	100	100	30

6.2 Harvest Prescription

Harvesting can take place within a buffer, but only if they do not compromise the function of the buffer. Buffer harvests can take place within the buffers that meet the appropriate criteria. License 5 will concentrate harvesting in the 76 and 100 meter buffers on the License, where possible, since these buffers are less likely to blow down. This harvest would consist of a 30% removal of volume, but must leave no less than 18-m2/ha basal area in the buffer. Also this volume must come from older, less stable trees within the buffer. This would promote stability within the buffer.

6.3 Summary of Harvest Volumes

Table 6.2 shows the estimated harvest from the buffers. These volumes are projected and not blocked at this time, since conditions for buffer harvest are subject to operational considerations.

Table 6.2 Estimated Buffer Harvest Volumes for Period 1

Spruce, Fir & Jack Pine	Hardwood	Cedar	Pine
759	1009	4	28

7.0 Recreation

The 2002 License 5 Management Plan will ensure that existing recreational opportunities are maintained with particular emphasis on the importance of protecting and preserving watercourses. However, every effort will be made to ensure that all areas are preserved and integrity is maintained.

Other recreational priorities are:

(i) Snowmobile trails
(ii) Kouchibouguac River: Fishing and canoeing
(iii) Public Access: designated roads are maintained and kept open for public travel.

8.0 Unique Sites

Unique sites include areas of ecological, historical, cultural or scenic value and the 2002 management planning requires they must be protected and preserved. The following unique site has been identified on License 5:

(1) Great Blue Heron colony

This and any further areas identified will require establishment of appropriate buffers to ensure that site quality is not compromised.

9.0 Long Term Forest Indicators

9.1 Vegetation and Habitat Community Objectives

In "A Vision for the New Brunswick Forests...Goals and Objectives for Crown Land Management" various minimum vegetative and habitat community objectives were required to be maintained. These objectives are not spatial in nature, but must be maintained on the License over the planning horizon. These areas are equivalent to 12% of the total area in each community as defined in the 1982 provincial inventory and adjusted for human disturbance. The habitat objectives were based on levels that were believed to be able to maintain viable populations of all species. Table 9.1 shows the habitat levels, while Table 9.2 shows the vegetative objectives for the License.

Table 9.1. Thresholds & aspatial supply of four wildlife habitat types by eco-region on License 5 under the proposed forest management strategy (all landbases combined) *Old Spruce-Fir has a spatial objective that applies for Periods 1 to 7(See Table 4.1)

Habitat Type	Eco-Region	Projected Habitat Supply (hectares) by Eco-Region & 5 Year Management Plan																
		Obj	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
Old Spruce- Fir Habitat	6	3960	11073	11429	10244	9669	8936	7247	7181	8051	7800	7909	8045	8248	7800	7800	7800	7800
Old Mixedwood Habitat	6	2560	5753	6484	6048	5608	5201	4808	4718	4958	4898	5293	5361	5391	5498	5684	6255	6452
Large Mixedwood Habitat	6	490	1907	1623	1454	1136	917	664	690	919	1064	1065	1515	1541	1597	1471	1546	1147
Old Hardwood Habitat	6	610	4913	5296	4735	4568	4222	4117	3778	3974	3921	4073	4299	4379	4540	4325	4112	3586

On a gross supply level all four-habitat types are met through out the planning time line. The gross supply level for OSFH was calculated to be at 7800 ha/period from period 8 on. This was achieved, and exceeded for Periods 8,10 - 12. From Period 9, 13 - 16 the 7800 level was achieved. For the other three habitat types, no constraints were needed. On a gross supply level these habitats were easily maintained.

Table 9.2. Forest Community Levels Achieved over the 80-year planning horizon on License 5.

ForCom	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
SP	1826	1603	2234	1970	1704	1552	1392	1390	1390	1451	1506	1489	1475	1340	1344	1340	1350
BS	5972	6768	6469	5494	5342	4823	3528	3563	3954	3906	3913	3780	4075	3757	3558	3082	2717
CE	1078	1024	1221	1159	1151	1116	970	895	939	949	904	844	740	643	638	500	600
PI	494	392	375	334	320	301	249	195	195	195	178	158	150	150	150	150	150
JP	1041	901	1203	848	541	351	350	350	350	350	350	350	350	350	350	350	350
THSW	439	506	1270	1417	1641	1884	1884	1885	2068	2123	2123	2123	2163	2235	2139	2201	2118

The minimum levels necessary to be maintained for the vegetative communities were set out in "A Vision for the New Brunswick Forests...Goals and Objectives for Crown Land Management". These minimum levels can be seen in Table 9.3. With the silviculture levels and constraints on other habitat types like OSFH and DWA, License 5 was able to meet all of the forest community levels but one. The THSW could not be met in the first period, but from period 2 on we were able to achieve the necessary levels of THSW. This is mainly due to the lack of such THSW forest community at this time. Jack Pine and Pine are achieved but at their minimum levels for a number of periods. This is possible due to the even flow harvest of softwood and planting of such species to replace them in future years. Planting of Pine types (RP, WP) is necessary to help achieve this objective in the long term. The SP forest community is achieved, however this appears to be affecting the Spruce, Fir and Jack Pine harvest, and spruce thinning (a thinning with 35% at peak RS) is used to help bolster this objective.

Table 9.3. Forest Community Minimum Objective Levels For License 5

Objective for Crown License 5 for OLD and/or LARGE Successional Stages (ha)		
Eco-Region	**Vegetative Community**	**ha**
6	THSW	1080
6	PINE (PI)	150
6	Jack Pine (JP)	350
6	Cedar (EC)	440
6	Spruce (SP)	1340
6	Black Spruce (BS)	2580

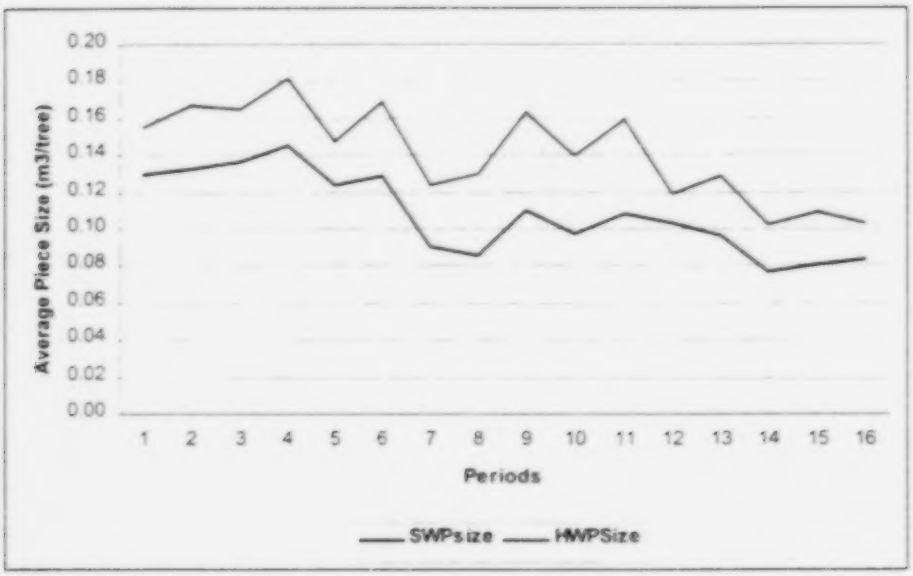
Tolerant Hardwood – Softwood (THSW): SW <50%: TH+RM $\geq$ 35% and < 75%
Pine (PI): SW $\geq$ 50%: PI $\geq$ 35%
Jack Pine (JP): SW $\geq$ 50%: JP $\geq$ 35%
Cedar (EC): SW $\geq$ 50%: EC $\geq$ 35%
Black Spruce (BS): SW $\geq$ 50%: BS $\geq$ 35%

Spruce (SP): SW $\geq$ 50%: SP $\geq$ 35%

9.2 Piece Size

Piece size is of concern to the sawmill industry in New Brunswick. Piece is the average volume per tree harvested. Figure 9.1 shows that piece size on License 5 will fluctuate over time. Average Piece size does increase from Period 8 to 11, it will then decrease from Period 11 to the end of the planning horizon. This is probably due to the model harvesting into younger stand types in order to ignore the older stand types to meet the OSFH and vegetative community constraints.

Figure 9.1. Average Piece Size for Harvested Softwood and Hardwood



9.3 Harvest Prescriptions

As mentioned in earlier sections, several harvest prescriptions will be used on License 5 over the planning horizon of 80 years. Clear-cutting of natural and managed stands will be the dominant prescription though on License 5. Commercial thinning will be employed during Period 1 through to Period 7. Commercial thinning is not employed after Period 7 in an attempt to increase the average piece size harvested in the future. Partial cut harvests in Tolerant Hardwood-softwood and Pure Tolerant Hardwood stand types are performed from through out the 80-year planning horizon, though at low levels. Some Tolerant Hardwood – softwood and Pure Tolerant Hardwood stands, which were 5 hectares or less, were targeted for clear cutting in the spatial blocking. Little of the cedar management partial cut will be employed over the 80 year planning horizon.

10.0 Protected Area

The Province of New Brunswick has committed itself to creating a network of protected areas within the province. To further this goal the Department of Natural Resources and Energy commissioned Dr. Louis LaPierre to develop a proposal for the creation of protected areas. These areas would be representative of New Brunswick landscape and serve as a bench mark for biodiversity and ecological integrity. After this commission was completed a stakeholder committee was organized to review Dr. LaPierre's findings. This committee came up with recommendations, one of which was the creation of a Proposed Protected Area on License 5. This protected area, called the Black River Protected Area, and consists of approximately 4000 hectares of land next to the Kouchibouguac National Park. Due to the nature of the Protected Area, License 5 has stopped all harvesting and silviculture activities within this area. The committee estimated that there would be a loss of 4228 m^3/yr from the Licenses AAC.

11.0 Summary and Discussion

11.1 Problems arising since the 1997 Management Plan

Several problems have arisen since the 1997 Management Plan:

1) There has been a volume short fall within the Period 1harvest blocks. To address this problem several steps have been taken:
    - Yield curves from the 1997 Management Plan were assessed as being too high. This was especially a concern with the pre-commercial thinning curves. New curves, approved by DNRE Region 2, at more reasonable volumes were used in the 2002 Management Plan.
    - Forest communities were reassessed and stratified upon the License in an effort to better classify the forest
2) The 1997 Management was constructed by splitting up the forest into Spruce-Fir, and Jack Pine Forest, Hardwood Forest and Cedar Forest. This made the plan fairly complex and difficult for implementation. This is especially true since the Cedar Forest is not very large on License 5. For the 2002 management plan process the General Forest was managed as a whole.
3) Due to miscommunication the DWA plans for the 1997 Management Plan were not approved by DNRE at this point. These plans are currently being revised for DNRE approval.
4) During the 1997-2001 Management Plan period a Proposed Protected Area was incorporated into License 5. This was a reduction of License 5's potential productive area of 6% of the License and a potential loss of 20,000 m^3/period for License 5.

11.2 Summary of Major Changes from 1997 to 2002

1. New yield curves were constructed using the New Brunswick Growth and Yield Units Yield Curve Application. These curves were based upon the forest communities within the License, with only a few being broken out by crown closure when deemed necessary. New plantation and pre-commercial thinning curves were created as well.
2. The entire forest was re-stratified and an intense assessment was made of previous years harvest blocks and silviculture.
3. A new transition matrix was created for License 5 by DNRE. This new matrix allowed for

various opportunities for silviculture based on potential stand densities within the regenerating curves.

4. Regeneration curves were constructed and supplied by Department of Natural Resources, Forest Management Branch.
5. Habitat and vegetative community objectives were to be maintained during the 80 year planning horizon, which were not present in the 1997 Management Plan.
6. Deer Winter Critical Habitat has now changed to Moderate and Severe Winter Deer Habitat. MWDH was to be maximized for within the 2002 Management Plan.
7. WOODSTOCK was used for the forest modeling, instead of FORMAN, in the 2002 Management Plan. For blocking purposes STANLEY was used to create the harvest blocks from Period 1 to 5.

11.3 Comparison of 2002 Results to 1997

11.3.1 Timber

The differences between the two plans, in regard to timber volume, can be seen in Table 11.1.

Table 11.1 Comparison of Spatial Potential Harvests from 1997 and 2002 Management Plans

	Spruce, Fir & Jack Pine (m3/yr)	Hardwood (m3/yr)	Cedar (m3/yr)	Pine (m3/yr)	Total
1997	59050	35725	4000	2220	100995
2002	42542	22924	3807	2216	71489
Difference	-16508	-12801	-193	-4	-29506

This drop in overall AAC can be attributed to several factors. The first is the yield curves were constructed for the 2002 Management Plan was lower that those of the 1997 Management Plan. This was especially true for the pre-commercial thinning curves. Secondly, License 5 is approaching its low point for Spruce, Fir and Jack Pine operable growing stock in the next five years. This low point is what governs the maximum even flow harvest within the forest. Thirdly, the License 5 forest is highly fragmented, making blocking for the mature and over-mature wood difficult at this point in time. Another factor was the inclusion of Black River Protected Area on License 5, reducing the potential AAC for the License by approximately 20,000 m^3/period. Plus with the inclusion of the Gross OSFH, forest habitat and vegetative objectives to be maintained, stands that could be included for harvest had to be over looked during the blocking phase so as to preserve these levels in the future.

11.3.2 Wildlife Habitat

11.3.2.1. Old Spruce-Fir Habitat

During the 2002 Management Planning process some changes were made to the MCFH blocks from the 1997 Management Plan. An assessment was made on OSFH in these MCFH blocks and a number of MCFH blocks were put back into the General Forest. However, some area was taken out of the General Forest to expand some of the remaining MCH Blocks, now OSFH blocks. Table 4.1 shows the various OSFH blocks and their habitat levels.

11.3.2.2. Deer Wintering Areas

No changes were made to the DWA land bases themselves for the 2002 Management Plan. The potential Moderate Winter Deer and Severe Winter Deer Habitat levels for this land base can be seen in Figure 5.3. On average the DWA will provide approximately 11,795 m^3/period from Periods 1 to 5.

11.3.2.3 Buffers

The buffers are maintained. Buffers harvests will take place, though wider buffers (76 & 100 m) will be targeted first. The buffer harvest in Period 1 is 2000 m^3.

11.3.2.4 Vegetative and Habitat Objectives

Weyerhaeuser has incorporated the vegetative and habitat objectives during the blocking phase of the management plan. Due to blocking and potential silviculture these objectives these objectives have been maintained.

11.3.2.5 Recreation

All recreation opportunities will be maintained as they were in the 1997 Management Plan.

11.3.2.6 Unique Sites

Weyerhaeuser has identified a Great Blue Heron site as a unique area. Other sites will be identified as unique, as they are found.

11.4 Conclusion

The Licensee has attempted to meet or exceed all the objectives that have been set out for the management of License 5.

12. APPENDICIES

Appendix 1: Common Abbreviations and Definitions
Appendix 2: 2002 Forest Management Goals and Objectives
Appendix 3: Description of Forest Strata (Classes) and Yield Curves Used in the Management Plan
Appendix 4: Description of Treatment Response & Silviculture Prescriptions
Appendix 5: Old Spruce-Fir Habitat Block Summaries
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Appendix 9: Mapped Harvest Blocks, DWAs, and OSFH by Period at 1:125,000
Appendix 10: Mapped Harvest Blocks, DWAs, and OSFH by Period at 1:125,000
Appendix 11: Management Plan Highlights

Appendix 1: Common Abbreviations and Definitions

Age Class: the interval into which the range of the ages is divided.
Even-aged: a forest where relatively small age differences exist between individual trees.
Inventory: the sum (by number, basal area, or volume) of trees in a forest.
Mature: the period in it life cycle when a tree or stand is at its peak volume.
Over-mature: the period of its life cycle when a tree or stand is declining in volume.
DNRE: Department of Natural Resources and Energy
AAC: Annual Allowable Cut
ACE: Allowable Cut Effect
OSFH: Old Spruce-Fir Habitat
LMWH: Large Mixedwood Habitat
OHWH: Old Hardwood Habitat
OMWH: Old Mixedwood Habitat
DWA: Deer Wintering Areas
MWDH: Moderate Winter Deer Habitat
SWDH: Severe Winter Deer Habitat

Vegetative Communities: Communities are defined using overstory tree species composition.

Pre-Commercial Thin: Density reduction technique to improve future stand growth.
Plantation: Involves planting of species of trees for future fiber and habitat concerns.
Clear-Cut: the harvesting of all merchantable trees from an area of forestland.
Partial Harvest: An uneven-aged harvest of timber involving the removal of only a portion of the stand volume.
Commercial Thin: cutting in an immature stand to improve quality, species composition and merchantable yield and to recover merchantable volume that may be otherwise lost.
Silviculture: the theory and practice of controlling the establishment, composition, constitution and growth of trees.
Sustainable: implies continuous production with the objective of achieving a balance between net growth and harvest of biological resources.
Uneven-aged: a forest, stand or forest type in which intermingling trees differ markedly in age.

Appendix 2: 2002 Forest Management Goals and Objectives

Appendix 3: Description of Forest Strata (Classes) and Yield Curves Used in the Management Plan

Theme 1 (corresponds to yield curves and forest stratification)

Natural Forest Types (YIMO Types)

BSH	Black Spruce Mix High Crown Closure
BSL	Black Spruce Mix Low Crown Closure
BFN	Balsam Fir Mix
ECL	Eastern Cedar Low Crown Closure
ECH	Eastern Cedar High Crown Closure
HWISH	Hardwood Intolerant/Spruce High Crown Closure combination of HWIF & HWIS
HWISL	Hardwood Intolerant/Spruce Low Crown Closure combination of HWIF & HWIS
HWIH	Hardwood, Predominately Intolerant Hardwood
HWIT	Hardwood, Mixture of Intolerant and Tolerant Hardwood
JPN	Jack Pine Mix
OS	Other Softwood (Eastern Hemlock and Tamarack/Larch)
PF	Pure Fir
PIN	Pine (White and Red Pine)
PS	Pure Spruce
PT	Pure Tolerant Hardwood
SF	Spruce/Fir Mixture
SPN	Spruce Mixture
TSST	Tolerant Hardwood/Spruce
TSTF	Tolerant Hardwood/Spruce/Fir
TSTI	Tolerant Hardwood/Spruce/Intolerant Hardwood

Regenerating Forest Types

BF1	Balsam Fir Option 1
BF2	Balsam Fir Option 2
BF3	Balsam Fir Option 3
BS1	Black Spruce Option 1
EC1	Eastern Cedar Option 1
HW3	Hardwood Option 3
HW4	Hardwood Option 4
PF2	Pure Fir Option 2
PF3	Pure Fir Option 3
SW3	Softwood Option 3
PLN	Plantation Option (Black Spruce, Jack Pine, Red Pine, White Pine)
PLB	Plantation Option (Black Spruce Only)
PLN1	Plantation Option (Jack Pine Only)
PLN2	Plantation Option (Red or White Pine)

Plantations & Pre-Commercial Thinning

PLBS	Black Spruce Plantation
PLBF	Balsam Fir Plantation
PLJP	Jack Pine Plantation
PLRP	Red Pine Plantation
PLWS	White Spruce Plantation
PLMS	Mixed Species Plantation
PLSP	Spruce Plantation
PLTL	Tamarack Plantation
PLWP	White Pine Plantation
BFT	Balsam Fir Pre-Commercial Thin
BST	Black Spruce Pre-Commercial Thin
BSCT	Black Spruce Commercial Thin (Natural Stand)
PFT	Pure Fir Pre-Commercial Thin
PTT	Pure Tolerant Hardwood Pre-Commercial Thin
PST	Pure Spruce Pre-Commercial Thin
SFT	Spruce-Fir Pre-Commercial Thin
SPT	Spruce Pre-Commercial Thin
HWITT	Hardwood, Mixture of Intolerant and Tolerant Hardwood Pre-Commercial Thin
JPT	Jack Pine Pre-Commercial Thin
HWIHT	Hardwood, Predominately Intolerant Hardwood Pre-Commercial Thin
HWIFT	Hardwood, Predominately Intolerant Hardwood with Balsam Fir Pre-Commercial Thin
HWIST	Hardwood, Predominately Intolerant Hardwood with Spruce Pre-Commercial Thin
PIT	Pine Pre-Commercial Thin
TST	Tolerant Hardwood/Softwood Pre-Commercial Thin

Partial Cuts - Previously on the License

PTPC	Pure Tolerant Hardwood Partial Cut
BFPC	Balsam Fir Partial Cut
ECPC	Eastern Cedar Partial Cut
BSPC	Black Spruce Partial Cut
HWISPC	Hardwood, Mix of Intolerant Hardwood and Spruce Partial Cut
OSPC	Other Softwood Partial Cut
TSTFPC	Tolerant Hardwood, with a Mixture of Spruce & Fir Partial Cut
PIPC	Pine Partial Cut

THEME 2

Stand Treatment Type

NAT	Natural Stand type
REG	Regenerating Stand Type
PC	Partial Cut Stand Type

CEX	Cedar Management (partial cut stand type)
TSX	Tolerant Hardwood/Softwood Partial Cut Stand Type
THX	Tolerant Hardwood Partial Cut Stand Type
PLT	Plantation
CT	Commercial Thinning
PCT	Pre-Commercial Thinning
CTNA	Commercial Thinning (Natural Stand Type)
BFC	Buffer Harvest

Theme 3
Eco-Districts
16
24

THEME 4
Management Units

1	Watercourse Buffer
1W	Watercourse Buffer (Wide Buffer)
3	Road Buffer (Beauty)
1000	Deer Wintering Area
1003	Deer Wintering Area Buffer (Beauty)
1001	Deer Wintering Area Watercourse Buffer
1001W	Deer Wintering Area Watercourse Buffer (Wide Buffer)
10001	Old Spruce-Fir Habitat Watercourse Buffer
10001W	Old Spruce-Fir Watercourse Buffer (Wide Buffer}
10000A	Old Spruce-Fir Habitat Block #583501
10000B	Old Spruce-Fir Habitat Block #593001
10000C	Old Spruce-Fir Habitat Block #593301
10000D	Old Spruce-Fir Habitat Block #603301
10000E	Old Spruce-Fir Habitat Block #603601
10001A	Old Spruce-Fir Habitat Block #583501 Watercourse Buffer
10001B	Old Spruce-Fir Habitat Block #593001 Watercourse Buffer
10001C	Old Spruce-Fir Habitat Block #593301 Watercourse Buffer
10001D	Old Spruce-Fir Habitat Block #603301 Watercourse Buffer
10001E	Old Spruce-Fir Habitat Block #603601 Watercourse Buffer
0	General Forest
2	General Forest Proposed Protected Area
20000	Previous OSFH Block Proposed Protected Area
20001	Previous OSFH Block Buffer Proposed Protected Area
2001	Previous Deer Wintering Area Buffer Proposed Protected Area
21	Water Course Buffer Proposed Protected Area

Appendix 4: Description of Treatment Response & Silviculture Prescriptions

Harvest Prescriptions and Operability Windows

Stands Eligible For Softwood Clear-Cut			
		Operability Windows (Years)	
Stratum Name		Start	Finish
BFN	NAT	50	150
BSH	NAT	60	160
BSL	NAT	70	150
ECH	NAT	95	170
ECH	CEX	105	165
ECL	NAT	95	165
ECL	CEX	105	150
JPN	NAT	50	145
OS	NAT	60	180
PF	NAT	50	110
PIN	NAT	80	150
PS	NAT	60	160
SF	NAT	55	165
SPN	NAT	60	150
BF1	REG	50	150
BS1	REG	60	160
EC1	REG	60	175
EC1	CEX	70	110
BST	PCT	60	150
BFT	PCT	60	135
PFT	PCT	50	105
PST	PCT	70	150
SFT	PCT	50	160
SPT	PCT	40	150
JPT	PCT	45	145
PIT	PCT	65	150
BST	CT	75	145
BFT	CT	75	130
PFT	CT	55	90
PST	CT	75	150
SPT	CT	60	145
BF2	REG	45	115
BF3	REG	50	120
SW3	REG	50	115
PF2	REG	50	105
PF3	REG	50	115
PLWP	CT	80	160
PLJP	CT	55	135
PLRP	CT	55	140
PLBS	CT	60	145
BSCT	CTNA	55	135

Stands Eligible For Hardwood Clear-Cut Operability Windows (Years)			
Stratum	Name	Start	Finish
HWISH	NAT	50	160
HWISL	NAT	70	160
HWIT	NAT	60	150
HWIH	NAT	60	150
HWITT	PCT	60	180
HWIHT	PCT	50	105
HWIFT	PCT	40	110
HWIST	PCT	45	130
HW3	REG	40	110
HW4	REG	40	110
HWIST	CT	65	115
HWIFT	CT	70	120

Plantations Eligible For Clear-Cut Operability Windows (Years)			
Stratum	Name	Start	Finish
PLBS	PLT	60	150
PLJP	PLT	40	140
PLRP	PLT	45	150
PLWS	PLT	60	150
PLMS	PLT	40	140
PLSP	PLT	40	150
PLTL	PLT	60	160
PLWP	PLT	60	150

Stands Eligible For Partial Cut Harvest Operability Windows (Years)			
Stratum	Name	Start	Finish
TST	PCT	45	115
TSST	NAT	65	160
TSTF	NAT	80	155
TSTI	NAT	70	150
PTT	PCT	75	170
PT	NAT	75	150
ECH	NAT	95	165
ECL	NAT	95	150
EC1	REG	60	100

Stands Eligible For Commercial Thin Operability Windows (Years)			
Stratum	Name	Start	Finish
BSCT	NAT	25	45
BFT	PCT	25	45
PFT	PCT	25	45
HWIST	PCT	25	45
HWIFT	PCT	25	45
BST	PCT	25	45
SPT	PCT	25	45
PST	PCT	25	45
PLBS	PLT	25	45
PLJP	PLT	25	45
PLRP	PLT	25	45
PLWP	PLT	25	45

- Stands that are Partially Harvested will transition to partial cut curve. This is designated by a change in the treatment theme. A Tolerant Hardwood Softwood Partial Cut falls to TSX (i.e. TSTF NAT to TSTF TSX). For Pure Tolerant Hardwood stands the

transition is to a THX treatment type. (i.e. PT NAT to PT THX). In the case of cedar management the treatment theme is CEX.

- Stands that are commercially thinned fall to a commercial thin curve. This is designated by a change in the treatment theme (i.e. BFT PCT to BFT CT). This is true for call commercial thins except for BSCT NAT which transitions to BSCT CTNA.

Stands Eligible For Buffer Harvest			
		Operability Windows (Years)	
Stratum Name		Start	Finish
BFN	NAT	85	140
BSH	NAT	70	135
HWISH	NAT	60	140
PF	NAT	55	85
JPN	NAT	65	135
PS	NAT	65	140
SF	NAT	85	140
SPN	NAT	80	145
BF2	REG	55	105
BF3	REG	50	110
SW3	REG	55	105

Stand Eligible for Clear Cut (TS/TH)			
		Operability Windows in Years	
Stratum Name		Start	Finish
TST	PCT	45	115
TSST	NAT	65	160
TSTF	NAT	80	155
TSTI	NAT	70	150
PT	NAT	75	150

Silviculture Prescriptions and Operability Windows

Stands Eligible For Plantation				
		Operability Windows (Years)		Potential To Transition to
Stratum Name		Start	Finish	Stratum
PLN	REG	0	5	PLJP,PLBS, PLWP,PLRP, PLWS
PLB	REG	0	5	PLBS
PLN1	REG	0	5	PLJP
PLN2	REG	0	5	PLRP, PLWP

Stands Eligible For Pre-Commercial Thinning					
Aggregate	Operability Windows (Years)				Potential To Transition to
	Stratum Name		Start	Finish	Stratum
EL2BS	BS1	REG	10	20	BST PCT
	BSH	NAT	10	20	BST PCT
	BSL	NAT	10	20	BST PCT
	SW3	REG	10	20	BST PCT
	EC1	REG	10	20	BST PCT
EL2BF	BFN	NAT	10	20	BFT PCT
	BF1	REG	10	20	BFT PCT
	BF2	REG	10	20	BFT PCT
	BF3	REG	10	20	BFT PCT
EL2HW	BF2	REG	10	20	HWIHT PCT
	BF3	REG	10	20	HWIHT PCT
	HW3	REG	10	20	HWIHT PCT
	HW4	REG	10	20	HWIHT PCT
	PF3	REG	10	20	HWIHT PCT
	SW3	REG	10	20	HWIHT PCT
	HWIH	NAT	10	20	HWIHT PCT
EL2MX	BF2	REG	10	20	HWIST PCT
	BF3	REG	10	20	HWIST PCT
	HW3	REG	10	20	HWIST PCT
	PF2	REG	10	20	HWIST PCT
	PF3	REG	10	20	HWIST PCT
	SW3	REG	10	20	HWIST PCT
	HWISH	NAT	10	20	HWIST PCT
	HWISL	NAT	10	20	HWIST PCT
EL2MS	BF2	REG	10	20	HWIFT PCT
	BF3	REG	10	20	HWIFT PCT
	HW3	REG	10	20	HWIFT PCT
	PF2	REG	10	20	HWIFT PCT
	PF3	REG	10	20	HWIFT PCT
	SW3	REG	10	20	HWIFT PCT
	HWISH	NAT	10	20	HWIFT PCT
	HWISL	NAT	10	20	HWIFT PCT
EL2HT	HWIT	NAT	10	20	HWITT PCT
EL2PF	PF	NAT	10	20	PFT PCT
	PF2	REG	10	20	PFT PCT
	PF3	REG	10	20	PFT PCT
EL2SP	SW3	REG	10	20	SPT PCT
	EC1	REG	10	20	SPT PCT
	SPN	NAT	10	20	SPT PCT
	SF	NAT	10	20	SPT PCT

Appendix 5: Old Spruce-Fir Habitat Block Summaries

Procedures for Determining Old Spruce-Fir Habitat Levels

Net Old Spruce Fir Habitat (OSFH Blocks)

- Maximize for OSFH in model within the OSFH landbase.
- Constraint for OSFH levels and maximize for harvest
- Analyze results and constrain OSFH habitat levels for OSFH blocks in main model

Gross Old Spruce-Fir Habitat

- With OSFH Block habitat and DWA habitat levels constrained for maximize harvest with suitable levels of silviculture constrained for
- Take lowest level of OSFH for license in first 35 years of the planning horizon, and determine Net/Gross OSFH ratio.

Gross Objective = to the Net Objective multiplied by the ratio of the Gross: Net OSFH found at the lowest period in the first 35 years where the Gross OSFH is lowest on the License.

Gross/Net OSFH Ratio = Minimum Gross OSFH level in first 35 years/ Net OSFH for the same period

- Net OSFH Objective is 3950 ha
- Gross/Net Ratio is 2
- Gross Objective = 7800 ha of OSFH to be constrained for Period 8 to the end of the planning horizon.

Shown in the table below is a summary of each OSFH block with its OSFH level for the first 35 years.

Old SF Habitat Objective by Eco-Region		OSFH Block #	Total Block Area (ha)	Old SF Habitat (ha) by 5 Year Management Period						
				1	2	3	4	5	6	7
6	3950	OSFH583501	828	504	548	568	610	619	632	636
		OSFH593001	1697	844	984	998	1192	1354	1371	1386
		OSFH593301	588	376	423	423	457	457	457	457
		OSFH603301	836	461	501	507	493	584	621	599
		OSFH603601	503	311	363	363	368	375	375	377
License 5 Totals (Gross Level OSFH (ha))				11073	11429	10244	9539	8936	7247	7181
OSFH (ha) in OSFH Blocks (Non-Intervention)				2497	2819	2859	3120	3389	3460	3462
OSFH (ha) in OSFH Blocks (Intervention)		Objective 3950		2497	2819	2859	3120	3389	3455	3455
% of Objective		After intervention		63%	71%	72%	79%	86%	87%	87%
Aspatial Harvest Level (m3) (unrelated)				10000	9500	9000	6000	4000	5182	4289

Individual OSFH Block Summaries

OSFH Block: OSFH593501 (MC593501 (P1-7) in 1997 FMP)
Ecoregion: 6 (100%)
Contributes to Net OSFH: 1-7
Total Block Area: 828 ha
DWA Overlap: 0%

Management Period	1	2	3	4	5	6	7
No Intervention OSFH Supply (ha)	504	548	568	610	619	632	636
% OSFH	61	66	69	74	75	76	77
Harvest Volume (m^3)	1402	1073	209	0	1720	91	141
Post Intervention OSFH Supply (ha)	504	548	568	610	619	632	636
% OSFH	61	66	69	74	75	76	77

OSFH Block: OSFH593001 (MC593001 (P1-7) in 1997 FMP) (Expanded Block)
Ecoregion: 6 (100%)
Contributes to Net OSFH: 1-7
Total Block Area: 1697 ha
DWA Overlap: 0%

Management Period	1	2	3	4	5	6	7
No Intervention OSFH Supply (ha)	844	984	998	1192	1354	1371	1386
% OSFH	50	58	59	70	80	81	82
Harvest Volume (m^3)	1374	346	7708	4420	2280	379	1301
Post Intervention OSFH Supply (ha)	844	984	998	1192	1354	1371	1386
% OSFH	50	58	59	70	80	81	82

OSFH Block: OSFH593301 (MC593301 (P1-7) in 1997 FMP)
Ecoregion: 6 (100%)
Contributes to Net OSFH: 1-7
Total Block Area: 588 ha
DWA Overlap: 0%

Management Period	1	2	3	4	5	6	7
No Intervention OSFH Supply (ha)	376	423	423	457	457	457	457
% OSFH	64	72	72	78	78	78	78
Harvest Volume (m^3)	3544	2894	1082	0	0	981	3270
Post Intervention OSFH Supply (ha)	376	423	423	457	457	457	457
% OSFH	64	72	72	78	78	78	78

OSFH Block: OSFH603301 (MC603301 & MC603302 (P1-7) in 1997 FMP) (Expanded Block)
Ecoregion: 6 (100%)
Contributes to Net OSFH: 1-7
Total Block Area: 836 ha
DWA Overlap: 0%

Management Period	1	2	3	4	5	6	7
No Intervention OSFH Supply (ha)	461	501	507	493	584	626	606
% OSFH	55	60	61	59	70	75	73
Harvest Volume (m^3)	379	2689	0	531	0	1404	4406
Post Intervention OSFH Supply (ha)	461	501	507	493	584	621	599
% OSFH	55	60	61	59	70	74	72

OSFH Block: OSFH603601 (MC603601 (P1-7) in 1997 FMP)
Ecoregion: 6 (100%)
Contributes to Net OSFH: 1-7
Total Block Area: 503 ha
DWA Overlap: 0%

Management Period	1	2	3	4	5	6	7
No Intervention OSFH Supply (ha)	311	363	363	368	375	375	377
% OSFH	62	72	72	73	74	74	75
Harvest Volume (m^3)	3302	2498	0	1049	0	377	857
Post Intervention OSFH Supply (ha)	311	363	363	368	375	375	377
% OSFH	62	72	72	73	74	74	75

Appendix 6: Approved DWA Management Plan Summaries

Individual Plans for Deer Wintering Areas will follow at a later date once approval has been achieved for the 1997 Management Plan Deer Winter Area Individual Plans.

Appendix 7: Computer File Description & Short Reports for Wood Supply Run (on CD)

Computer Modeling

The software used for modeling is called WOODSTOCK and is produced by REMSOFT of Fredericton New Brunswick. This modeling software uses several files, a list of which can be seen below.

PRIORITY [LIC5.PRI]
ACTIONS [LIC5C.ACT]
AREAS [LIC5C.ARE]
CONTROL [LIC5.RUN]
GRAPHICS [LIC5.GRA]
LANDSCAPE [LIC5.THE]
LIFESPAN [LIC5.LIF]
OPTIMIZE [NEW.OPT]
OUTPUTS [LIC5C.OUT]
REPORTS [LIC5C.REP]
SCHEDULE [Final.SEQ]
TRANSITIONS [LIC5C.TRN]
YIELDS [LIC5.YLD]
LPSCHEDULE [rev13sch.seq]

These files can be found in the MODEL directory of the CD accompanying this management plan.

The PRIORITY file list all the other files and lets WOODSTOCK recognize them.
The ACTIONS file contains all actions or interventions that can take place in the model. This includes all harvesting and silviculture actions.
The AREAS file is that contains the stratification of the License 5 landbase. It contains Themes 1 to 4, age (in periods) and area (in hectares).
The CONTROL file controls various aspects of the model, such as turning on or off the LPSCHEDULE file.
The GRAPHICS file contains the information for creating graphs on screen of the results from the models run. This is an optional file.
The LANDSCAPE file contains the break down of each theme within the area file. Aggregates can be created of these strata for reporting and constraint options.
The LIFESPAN file contains the potential life span for the strata within the model. This is necessary for the action DEATH.
The OPTIMIZE file contains the optimization objective, any constraints place on the model, plus the ability to exclude actions for various periods if necessary. This is the main file used when optimization is used in running the model.
The OUTPUTS file contains each output and its source for the model. The outputs can be used for reporting or can be used in the optimization file as constraints or objectives.
The REPORTS file produces reports on the outputs within the model. Selected outputs can be

transition reassigns a stratum to a new stratum once an action has taken place. (I.e. BFN NAT 24 to BF1 REG 24 0 after clear cut)
The YIELDS file contains all the yield curves used for projecting timber volume and habitat values. These are linked to each of the stratum in the area file.
The LPSCHEDULE file is a special file, which contains a sequence of events that the modeler wishes to take place. In the case of this plan, the LPSchedule file contains the harvest blocks for the first 25 years of the management plan.

Spatial Blocking

The STANLEY program was used for the spatial blocking phase of the management plan. STANLEY uses the WOODSTOCK model files, plus a shape file of the landbase in question. STANLEY creates several files, including reports. The spatially blocked shape file can be found in the BLOCKS directory that can be found on the CD that accompanied this management plan.

Reports

The reports produced by WOODSTOCK for the spatial plan can be found in the REPORTS directory on the CD. The block report from STANLEY can be found in the same directory.

Appendix 8: Mapped Harvest Blocks, DWAs, and OSFH by Period at 1:125,000

The OSFH and DWA harvest Block maps will follow at a later date once approval has been achieved for these blocks.

Appendix 9: Mapped Harvest Blocks, DWAs, and OSFH by Period at 1:12,500

The OSFH and DWA harvest Block maps will follow at a later date once approval has been achieved for these blocks.

Appendix 10: Management Plan Highlights

Brochure to follow once final management plan approval is given.